U.S. 40 Corridor Study Crash History and Analysis

in support of the
U.S. 40 Corridor Study

MP 21 in Wasatch County to MP 147
in Uintah County, Utah

Utah Department of Transportation

Project No. S-0040(65) 21

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June 2007

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1.0 Introduction

1.1 Crash History and Analysis

One of the most fundamental ways that transportation investments can enhance quality of life is by making it possible for people to move about the state in relative safety. While it will never be possible to remove all risk involved in moving people or goods, it is an important public policy objective to identify particularly high-risk circumstances and address them as comprehensively as possible.

Improving highway safety requires consideration of the three elements influencing traffic operations: the driver, the vehicle, and the roadway. Although traffic engineers have effective control over only one of these elements—the roadway—from the planning perspective policies could be implemented to address better information outreach and behavior. Traffic safety can be approached in a number of different ways: reducing crash occurrences, reducing the severity of crash, improving crash survivability, enforcing safety control efforts and improving design aspects of the road. Both physical alterations and social policies should be considered to enhance safety in the corridor.

This technical memorandum presents an analysis of five years of crash data obtained from Utah Department of Transportation (UDOT) Office of Traffic and Safety.

1.2 Study Area

This study encompasses a specific area along US 40 through Wasatch, Duchesne and Uintah counties in Utah. The study corridor begins in the west at Mile Post (MP) 21.4, roughly the mouth of Daniels Canyon, and ends approximately 135 miles to the east at MP 157.1, at the edge of Jensen. The study corridor is shown in Figure 1.

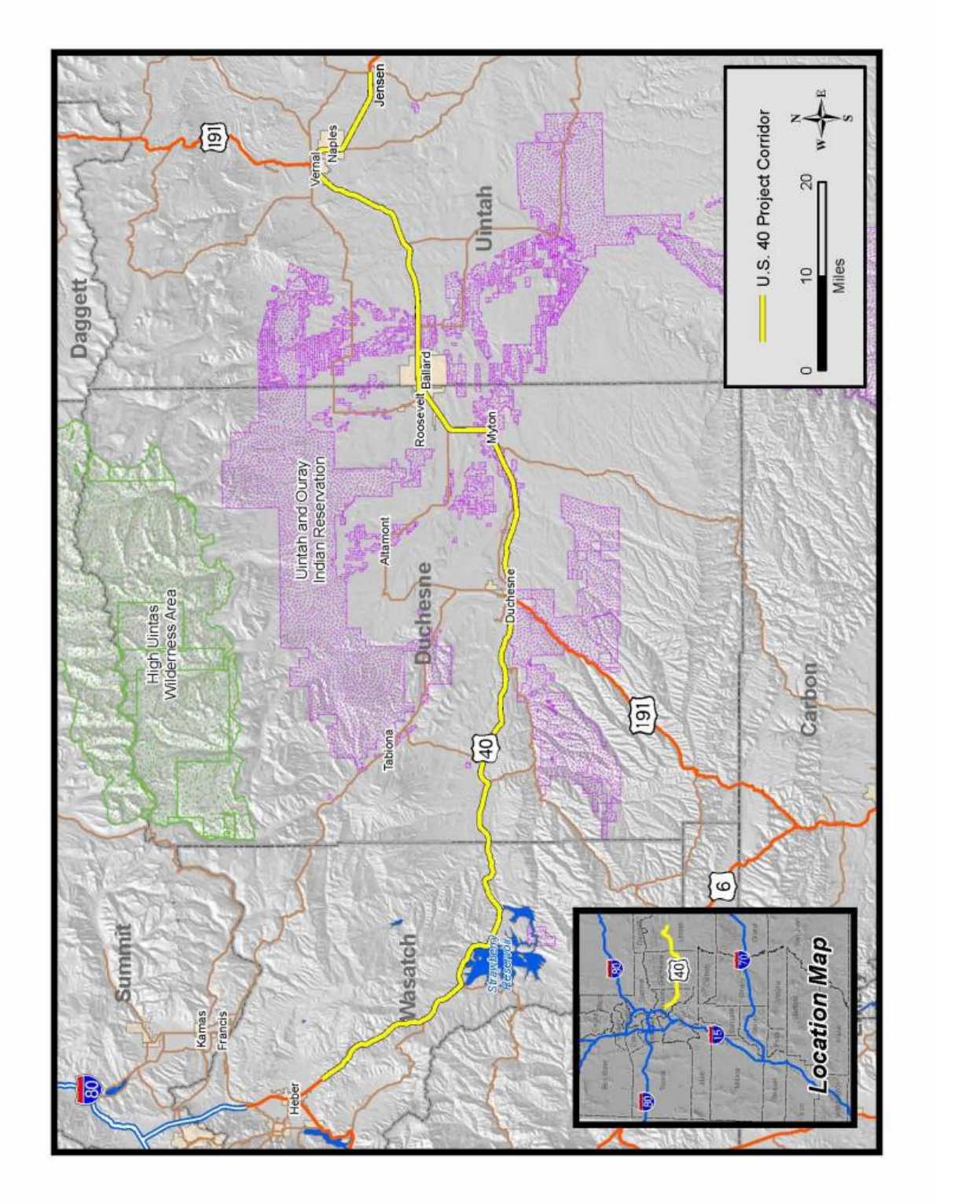

Figure 1. Study Area Map

The UDOT crash database provides a variety of information about each reported crash. At times, not all information is provided for each crash in each location. Crash data is provided by the police officers called to the scene, and depends on the specifics of each report. The information generally includes:

- Location by Milepost (as estimated by reporting officer)
- Crash Severity and Number of fatalities and injuries
- Number and type of vehicles
- Drivers action for each vehicle involved
- Type of collision
- Location in relation to intersection and roadway
- Contributing circumstances
- Weather, roadway surface, and light conditions
- Day of week, hour of day, and date of crash

The first section of the document includes the main findings and overall crash statistics. Subsequent sections present the information using the following structure:

Corridor's Crash Statistics
Crash History
Crash Rates
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Where & When
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Roadway Surface Condition
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Type of Collision
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2.0 Main Findings

- The number of crashes increased significantly in 2004-2005 over 2001-2003.
- The crash rate was above the statewide average for the rural sections of the corridor for the last three years of the study.
- The majority of the crashes (84 %) occurred on a dry roadway surface.
- Failure to yield right-of-way (16%), improper lookout and maintaining too fast a speed (15% each) were the three main contributing circumstances.
- Collision with a moving vehicle was the most frequent crash occurrence (40%) and the most frequent fatal crash occurrence (73%).
- Wild animals were involved in 32% of crashes in the study corridor.* Wild-animal-related incidents were not clustered in one particular area, but occurred regularly throughout the corridor.
- After maintaining too fast a speed(17%), failure to yield (11%) was the most common contributing circumstance to fatal crashes.
- Only 1out of every 4 crashes was at an intersection or intersection related.
- Young drivers (age 15 -19) constitute a disproportionately high percentage of all drivers involved in crashes in the corridor. Drivers in this age group had 16 percent of the crashes in the study corridor.

* May be higher, since many wild animal collisions go unreported.

3.0 Crash Statistics & Rates

Crash data were obtained for the years 2001 through 2005. The data reflect the crashes where accident reports were completed and do not include or purport to estimate unreported crashes that may have occurred during the analysis period.

3.1 Crash History

As shown in Table 1, there were 2,054 crashes in the US 40 corridor study area during the five-year analysis period. A total of 3,020 vehicles were involved.

2004 and 2005 saw a nearly 20 percent increase in crashes annually over 2001-2003. The average number annual crash-related fatalities doubled from 2001 to 2002, and then stayed level for the rest of the study period.

Table 1. Crash History by Year for US 40 Corridor, 2001-2005

Year	Number of Crashes									Persons Involved in Crashes		
	Total	Fatal		Injury*		Possible Injury		PDO		Fatalities	Injuries*	Total
2001	388	4	1.0%	59	15.2%	43	11.1%	282	72.7%	5	103	911
2002	387	8	2.1%	82	21.2%	39	10.1%	258	66.7%	13	137	995
2003	382	7	1.8%	77	20.2%	43	11.3%	255	66.8%	9	131	846
2004	452	7	1.5%	77	17.0%	46	10.2%	322	71.2%	8	128	1035
2005	445	7	1.6%	79	17.8%	42	9.4%	317	71.2%	9	123	1091
Total	**2054**	**33**	**1.6%**	**374**	**18.2%**	**213**	**10.4%**	**1434**	**69.8%**	**44**	**622**	**4878**

Source: HDR, UDOT Office of Traffic and Safety

* *Includes Bruises & abrasions (code 3) and Broken bones or bleeding wounds (code 4) / Possible Injuries (code 2) not included. - PDO= Property Damage Only*

Fatal crashes accounted for approximately 1.6 percent of all crashes. Overall, there were 33 fatal crashes resulting in 44 fatalities. Injury crashes accounted

for approximately 18.2 percent of all crashes, with 374 crashes resulting in 622 injuries of varying severity. Crashes with property damage only (PDO) accounted for approximately 70 percent (1434) of all crashes.

3.2 Crash Rates

UDOT maintains annual crash rate information for different types of roadways throughout the state. The crash rate calculation takes into account the characteristics of the roadway, including number of travel lanes, access control, type of median, roadway width, and average annual daily traffic (AADT) volumes. It is based on the millions of vehicle miles traveled.

The accident rate data for the US 40 corridor have been divided into two groups for this study, based on the functional classifications of US 40. The section of US 40 that passes through Vernal and Naples, from MP 141.46 to MP 148.24, is listed by UDOT as "other small urban area principal arterial," whereas the remainder of the corridor is "other rural principal arterial." While AADT does rise as the corridor passes through Roosevelt, that area has not been reclassified from rural by UDOT and so is considered as rural for the purposes of this study.

Table 2 compares the local accident rate to the state average accident rates for these functional classes. The accident rate reflects the number of accidents that occur in a segment per one million vehicle miles traveled. In both the rural and small urban areas, the average accident rate over the five year study period was lower than the state average.

Table 2. Average Accident Rates in the Study Area and Across the State, 2001-2005

	Accident Rates (per 1 MVM)	
Functional Class	**US 40 Corridor**	**Utah Statewide Average**
Rural Principal Arterial-Other, AADT < 5000	1.35	1.46
Small Urban Principal Arterial-Other, AADT 20000	2.06	3.53

Source: HDR, UDOT Office of Traffic and Safety

Yet 2002 was the only year in which the rural accident rate, at 1.33, was much lower than the state average (Table 2). Without the low rate achieved that year, the average would have been 1.54, over the state average for similar roadways.

Table 3 also shows that 2001 was an extraordinarily low year for crashes in the Vernal-Naples area. Unlike the rural data, however, even without the lowest crash rate figured in, the area is still below state average.

In general, the yearly data reflect a trend toward higher crash rates in both rural and small urban segments. The rural crash rate should be especially concerning, as it has been steadily above the state average since 2002.

Table 3. Accident Rates by Year for the US 40 Corridor, 2001-2005

	Accident Rates (per 1 MVM)					Utah Average
Functional Class	2001	2002	2003	2004	2005	
Other Rural Principal Arterial, AADT < 5000	1.45	1.33	1.52	1.71	1.49	1.46
Other Small Urban Principal Arterial, AADT >20000	1.62	2.52	2.43	2.28	2.51	3.53

Source: HDR, UDOT Office of Traffic and Safety

3.3 Severity Rates

UDOT uses accident severity rates to compare the intensity of injury occurring during crashes among segments of road of the same functional classification. This rate assigns crashes a point value commensurate with their severity, and then averages the total severity score by the number of crashes.

Table 4 lists the severity rates for the two sections of the study corridor, as well as the average statewide severity rate for like roads. In both cases, the crashes along the study corridor tend on average to result in less severe injuries than they do across the state.

Table 4. Average Accident Severity Rates in the Study Area and Across the State, 2001–2005

	Severity Rates	
Functional Class	**US 40 Corridor**	**Utah Statewide Average**
Rural Principal Arterial-Other, AADT < 5000	1.63	1.7
Small Urban Principal Arterial-Other, AADT 20000	1.56	1.62

Source: HDR, UDOT Office of Traffic and Safety

Table 5 presents the severity rate data by year. Both sections of the corridor had severity rates higher than the state average in 2002. The rural severity rate may be inflated by the drop in rural accidents that year. For both sections, though, the severity rate spiked in 2002 and has slowly fallen each year since.

Table 5. Severity Rates by Year for the US 40 Corridor, 2001–2005

	Severity Rate					
Functional Class	2001	2002	2003	2004	2005	Utah Average
Other Rural Principal Arterial, AADT < 5000	1.55	1.71	1.69	1.58	1.62	1.7
Other Small Urban Principal Arterial, AADT >20000	1.52	1.68	1.57	1.62	1.44	1.62

Source: HDR, UDOT Office of Traffic and Safety

3.4 The Cost of Crashes

The Federal Highway Administration (FHWA) has assigned monetary values for each level of crash severity. These values attempt to quantify the various costs to the public—property damage, hospitalization for injury, and loss of life among them—resulting from unsafe passages. This value is one measure of the cost of not making needed improvements to a roadway.

Table 6 calculates the cost of crashes on the US 40 corridor. From 2001-2005 the equivalent of $169 million was lost through accidents on this corridor. Based on this data, crashes cost the public $33.8 million annually on this stretch of highway alone.

Table 6. Costs of Crash Incidents 2001-2005

Accident Severity	PDO	Possible	Evident	Incapacitating	Fatal	Grand Total
Number of accidents 2001-2005	1434	213	214	160	33	2054
Cost per incident*	2,616	24,854	47,092	235,458	3,401,059	
Total cost, in millions of dollars	3.8	5.3	10.1	37.7	112.2	**169.0**

Source: HDR, UDOT Office of Traffic and Safety, *FHWA

Figures 2 through 5 map the location of each accident described in this section by its severity. Fatalities are more prevalent toward the mountains and canyons of the west than the urban area to the east. (While the FHWA uses separate measures for Evident and Incapacitating injuries, this study refers only to injury crashes.) For ease of reference, the corridor was broken into four sections for mapping in this document.

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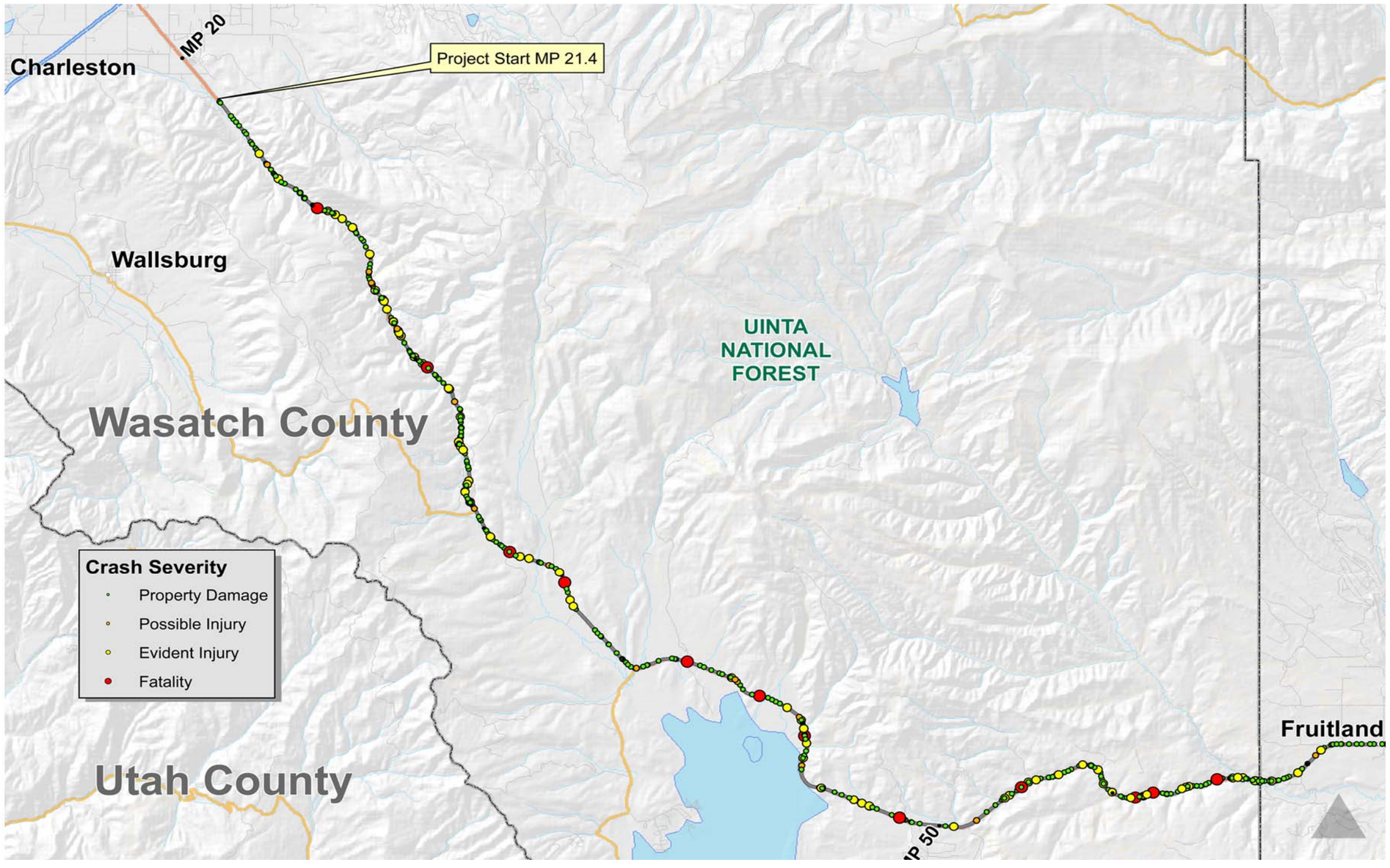


Figure 2. Accidents by Location and Severity, 2001-2005, Map 1

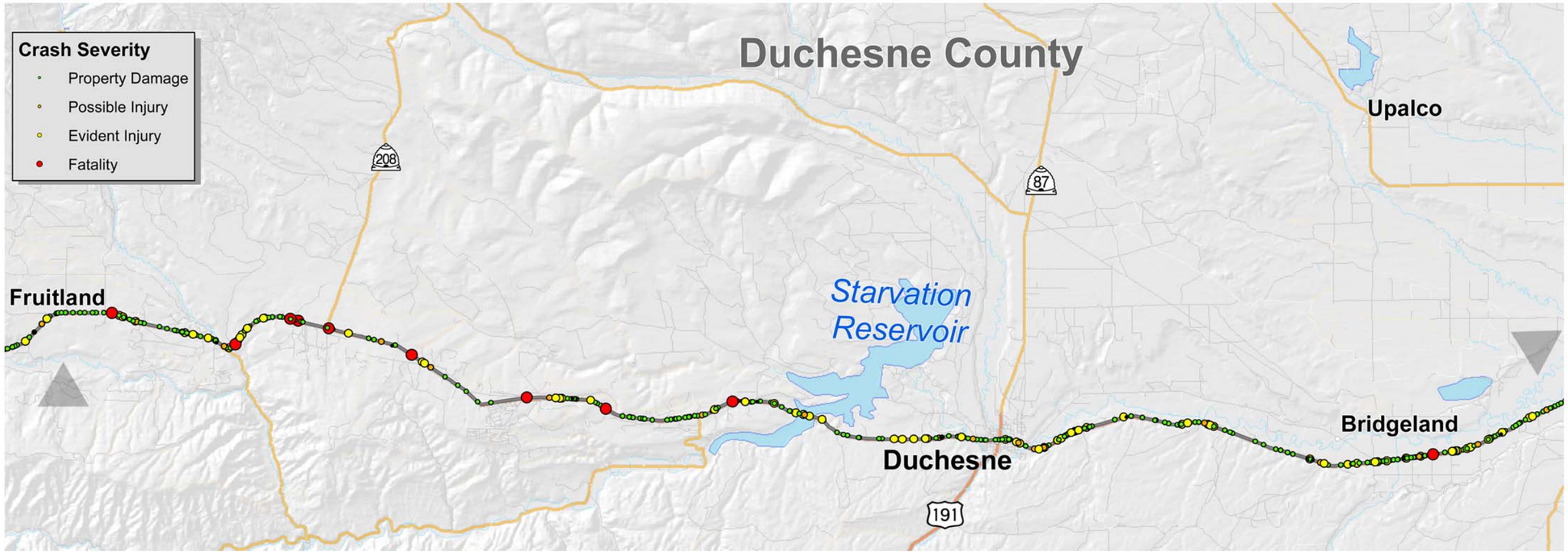


Figure 3. Accidents by Location and Severity, 2001-2005, Map 2

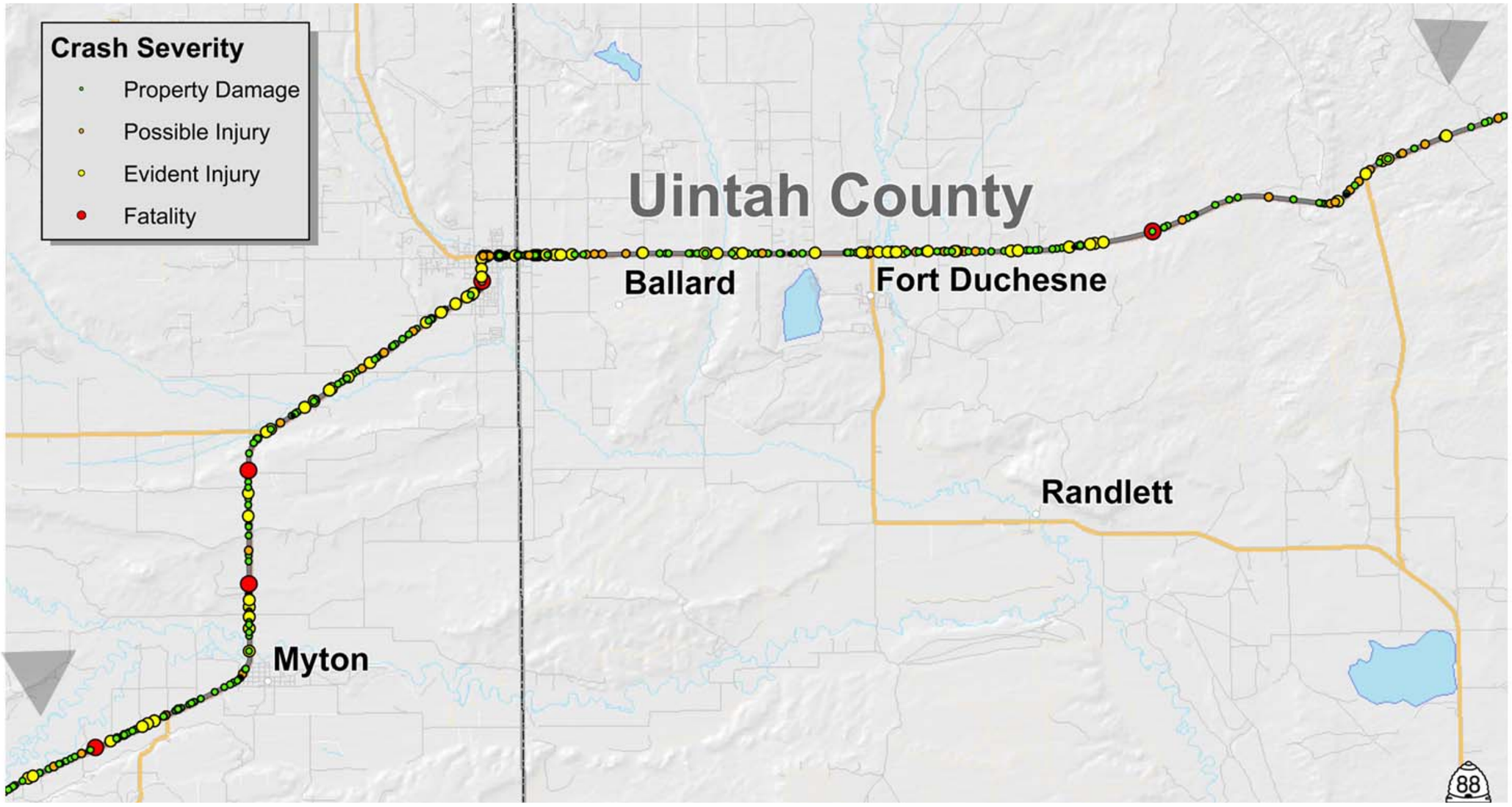


Figure 4. Accidents by Location and Severity, 2001–2005, Map 3

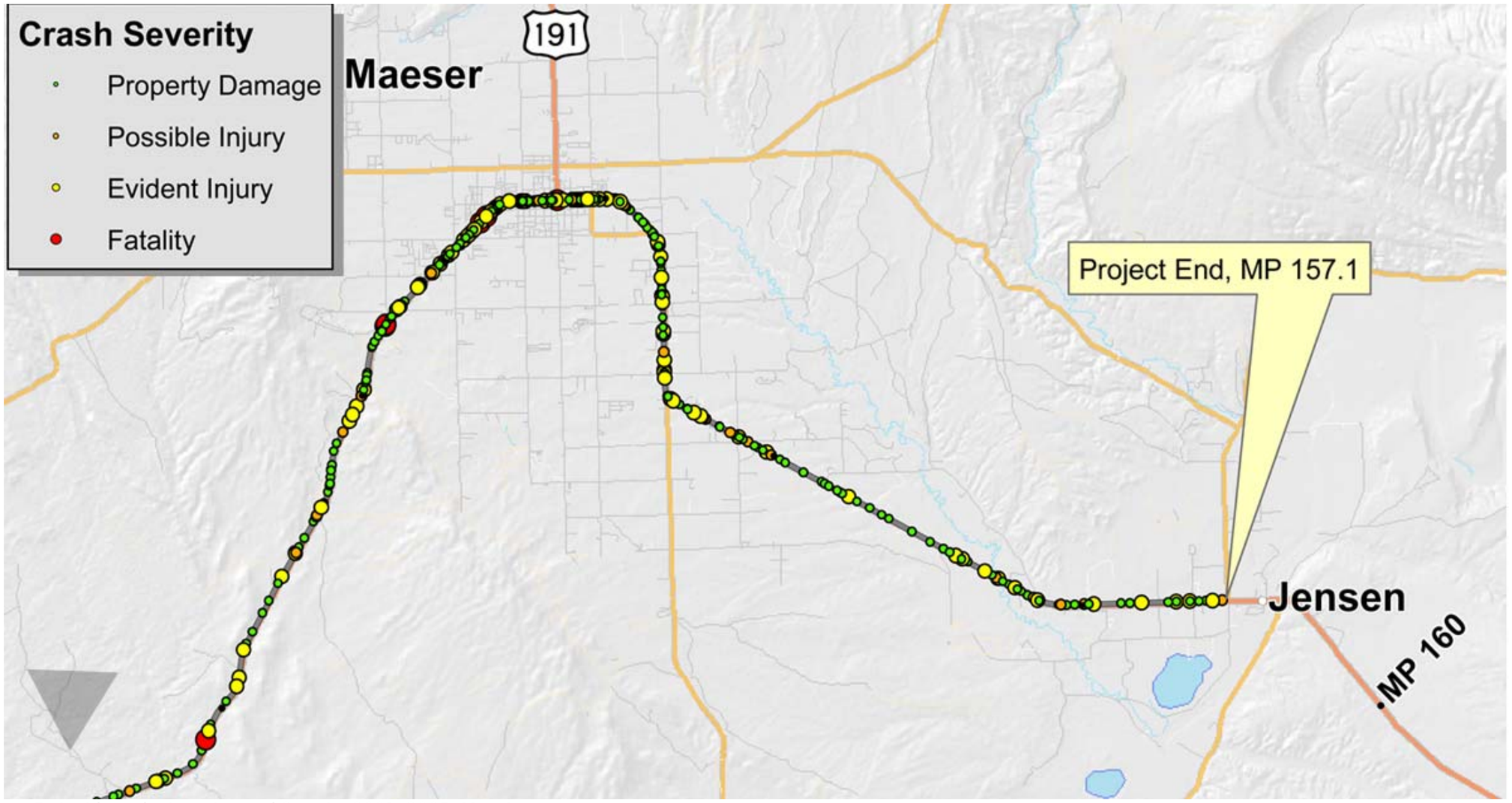
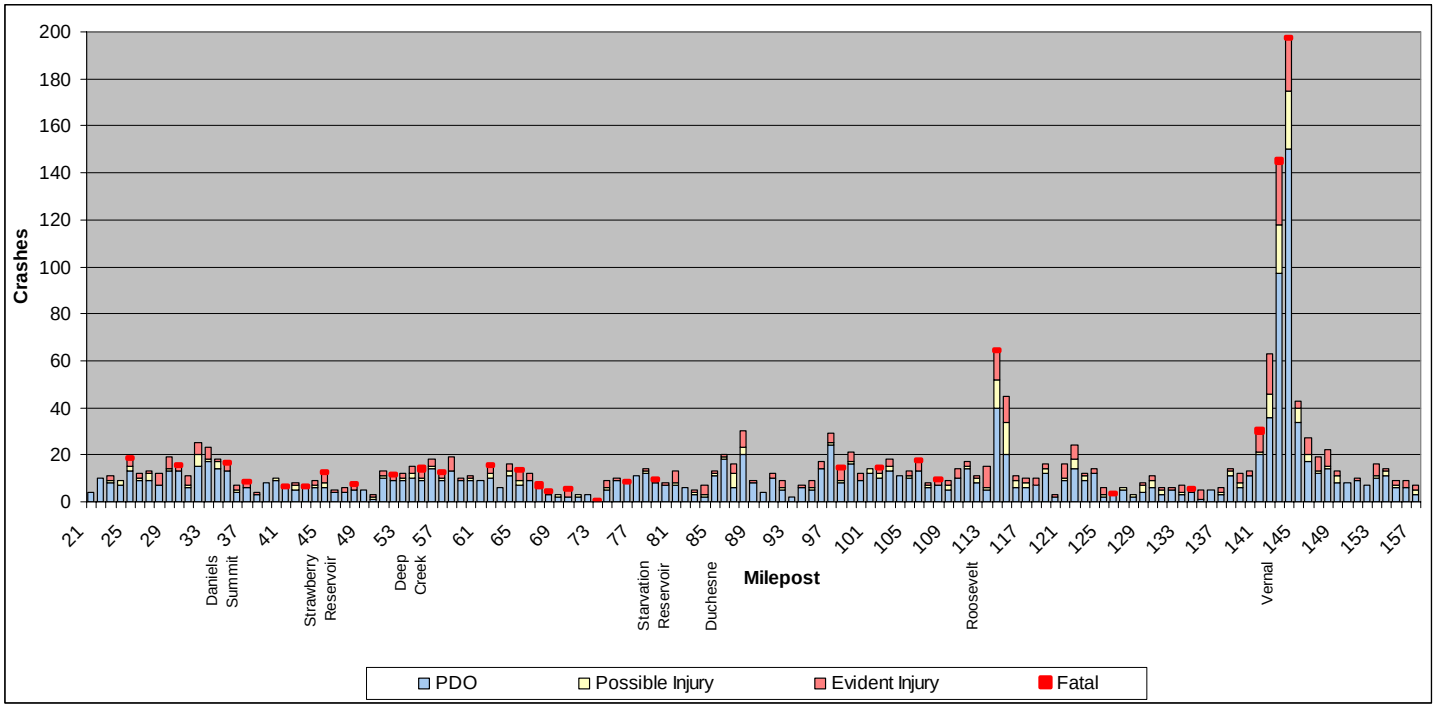


Figure 5. Accidents by Location and Severity,2001-2005, Map 4

4.0 Where & When

There is a notable increase in crashes in the urbanized areas, particularly Vernal (Figure 6). Areas of urbanization as these typically have higher traffic volumes, and a greater number of intersections and access roads, making crashes more likely than in rural areas. The area in Vernal that relates to the highest crash incidents are around the downtown. This is to be expected given the higher traffic volumes and the series of signals that control traffic in the downtown.

Figure 6. Crash Frequency and Location



Source: HDR, UDOT Office of Traffic and Safety

4.1 Junctions

The area formed when two roadways meet is referred to as a "junction." Junctions include intersections, interchanges, and entrance/exit ramps. As can be seen in Table 7, crashes occurring within the US 40 corridor study area are not highly related to junctions. Over three-quarters of the total number of crashes along this corridor are not junction-related (1,561).

Table 7 shows the crash data in terms of junction involvement. Those crashes which occurred at junctions were over three times more likely to have happened at four-way stops than at T-style intersections (374 crashes vs. 119). Four-way stop intersections prove particularly hazardous in the urbanized areas: around MP 86 in Duchesne, from MP 99 to MP 106 through Myton, MP 111 to MP 116 through Roosevelt, and MP 140 to MP 150 through Vernal.

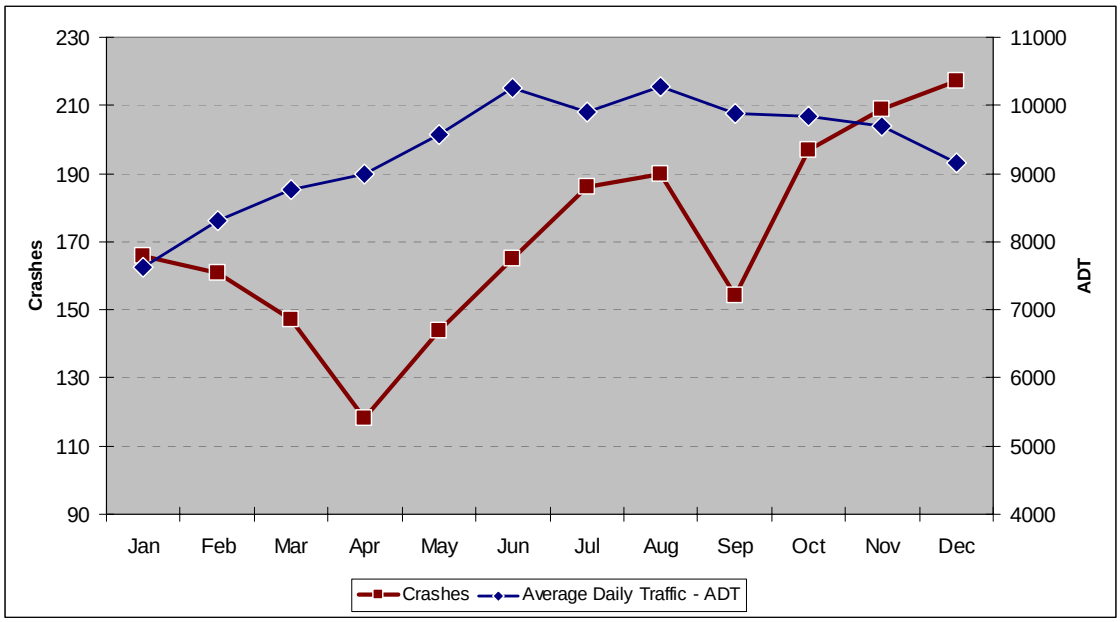
Table 7. Crash History by Relationship to Junction by Severity, 2001-2005

Relation to Junction	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Nonjuction	1561	76%	26	79%	254	68%	150	70%	1131	79%
4 Way Intersection	374	18%	6	18%	83	22%	47	22%	238	17%
T Intersection	119	6%	1	3%	37	10%	16	8%	65	5%
Total	**2054**		**33**		**374**		**213**		**1434**	

Source: HDR, UDOT Office of Traffic and Safety

Figure 7 displays the crash data by month of the year. In August, during the peak summer driving season, the Average Annual Daily Traffic (AADT) in the corridor study area is 10,273 vehicles a day. That is an increase of 2500 vehicles per day over the month of lowest use, January, which sees 7624 vehicles a day.

Figure 7. Crash History and Average Annual Daily Traffic by Month, 2001-2005



Source: HDR, UDOT Office of Traffic and Safety, UDOT Planning Statistic Section
Crashes: Total Number between 2001 & 2005
ADT: Average Daily Traffic in 2006 recorded by Automatic Recorder 425 – MP 111.56

According to Figure 7, crashes are influenced by both traffic and poor weather. August may have the highest AADT, but it only has the fourth highest average crash rate, because the roads stay clear in the hot weather. Instead, crashes spike in November and December, during which poor winter road conditions combine with heavy holiday road use to contribute to crashes. Those months with low AADT and fair conditions, like April and September, see the fewest crashes in this corridor.

5.0 Vehicles, Conditions & Events

Table 8 puts the crash data in terms of crash severity and number of vehicles involved. While most accidents involved just one car, those involving two cars were more likely to result in injury or fatality. For fatal crashes, 86 percent of incidents involved two vehicles (24); 21 percent involved a single vehicle (6). For crashes involving Property Damage Only (PDO), a single vehicle was involved in 61 percent of the crashes (879); two vehicles, 37 percent (525).

Table 8. Crash History by Number of Vehicles Involved, 2001-2005

Number of Vehicles Involved	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
1	1155	56%	6	21%	184	49%	86	40%	879	61%
2	827	40%	24	86%	166	44%	112	53%	525	37%
3	67	3%	2	7%	23	6%	14	7%	28	2%
4 or more	5	0%	1	4%	1	0%	1	0%	2	0%
Total	**2054**		**28**	**1%**	**374**	**18%**	**213**	**10%**	**1434**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

Table 9 describes the road conditions at the time of each crash. Most crashes (84 percent) occurred on dry roads, with just 7 percent taking place in wet conditions and 5 percent in snow. While snowy, wet, and icy conditions contributed to 16 percent of all crashes, they contributed to 39 percent of fatal accidents. This suggests that weather contributes to the severity of crashes in the corridor more than their likelihood of occurring.

Table 9. Crash History by Roadway Surface Condition, 2001-2005

Roadway Surface Condition	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Dry	1706	84%	20	61%	309	84%	165	77%	1212	85%
Wet	150	7%	7	21%	21	6%	28	13%	94	7%
Snowy	98	5%	5	15%	22	6%	7	3%	64	4%
Ice	79	4%	1	3%	16	4%	11	5%	51	4%
Oily	2	0%	-	-	-	-	1	0%	1	0%
Unknown	2	0%	-	-	-	-	1	0%	1	0%
Total	**2037**		**33**	**2%**	**368**	**18%**	**213**	**10%**	**1423**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

As can be seen from Figures 8 through 11, mountainous conditions and high altitudes combined to make some particularly dangerous areas for winter driving. The stretch from MP 25 to MP 34, the western approach to Daniels Summit, saw many crashes due to snowy and icy conditions. So did the area around Deep Creek, MP 54 to MP 58. After Deep Creek, ice and snow were less often a factor in crashes, except for in urban areas and around MP 130 and MP 155, on either side of Vernal.

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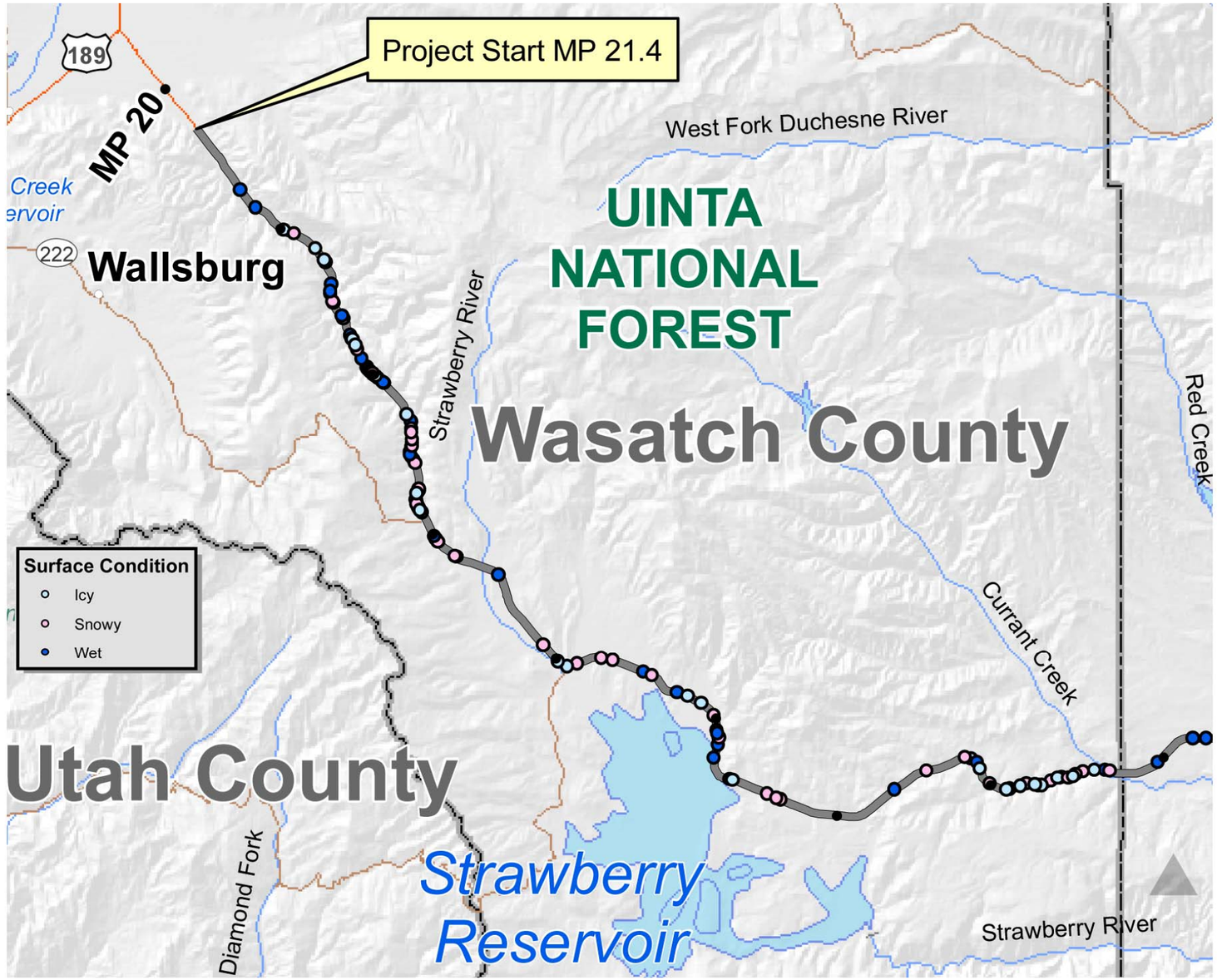

Figure 8. Accidents by Surface Conditions, 2001–2005, Map 1

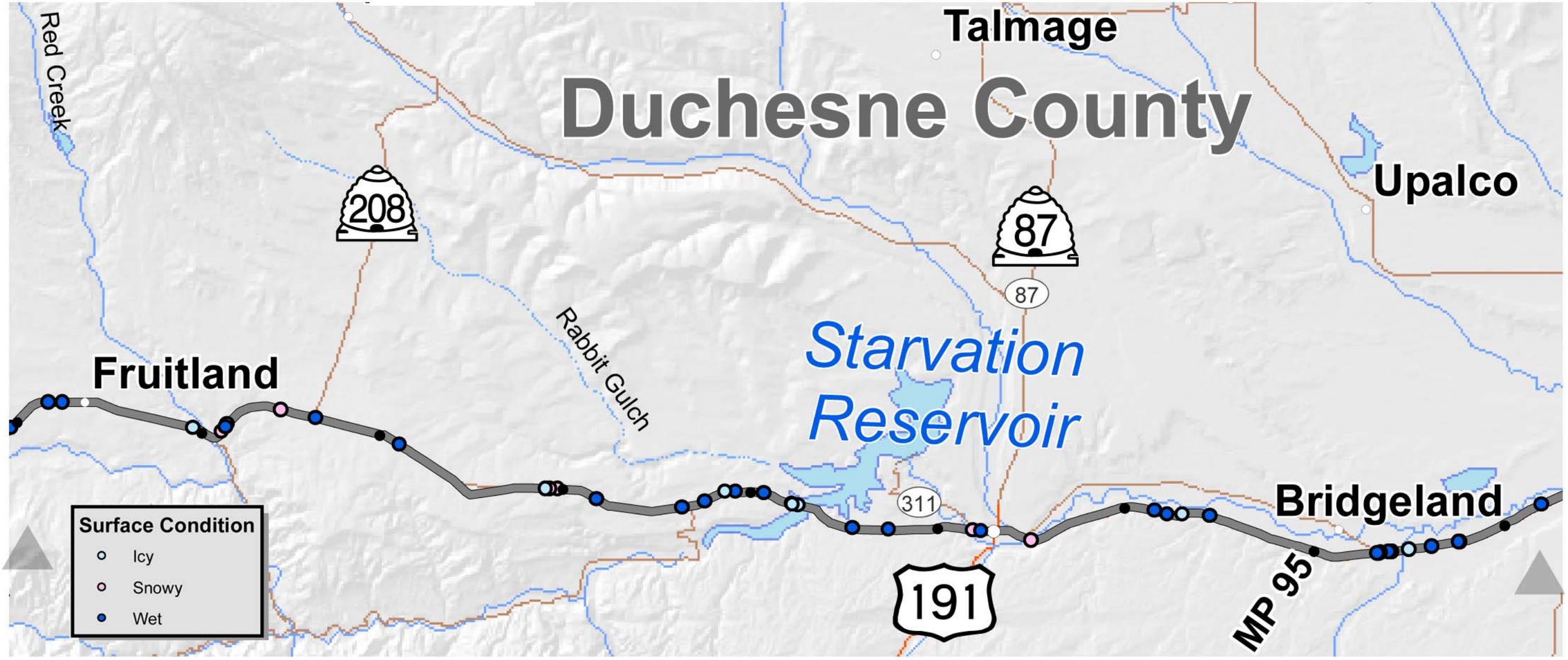

Figure 9. Accidents by Surface Conditions, 2001-2005, Map 2

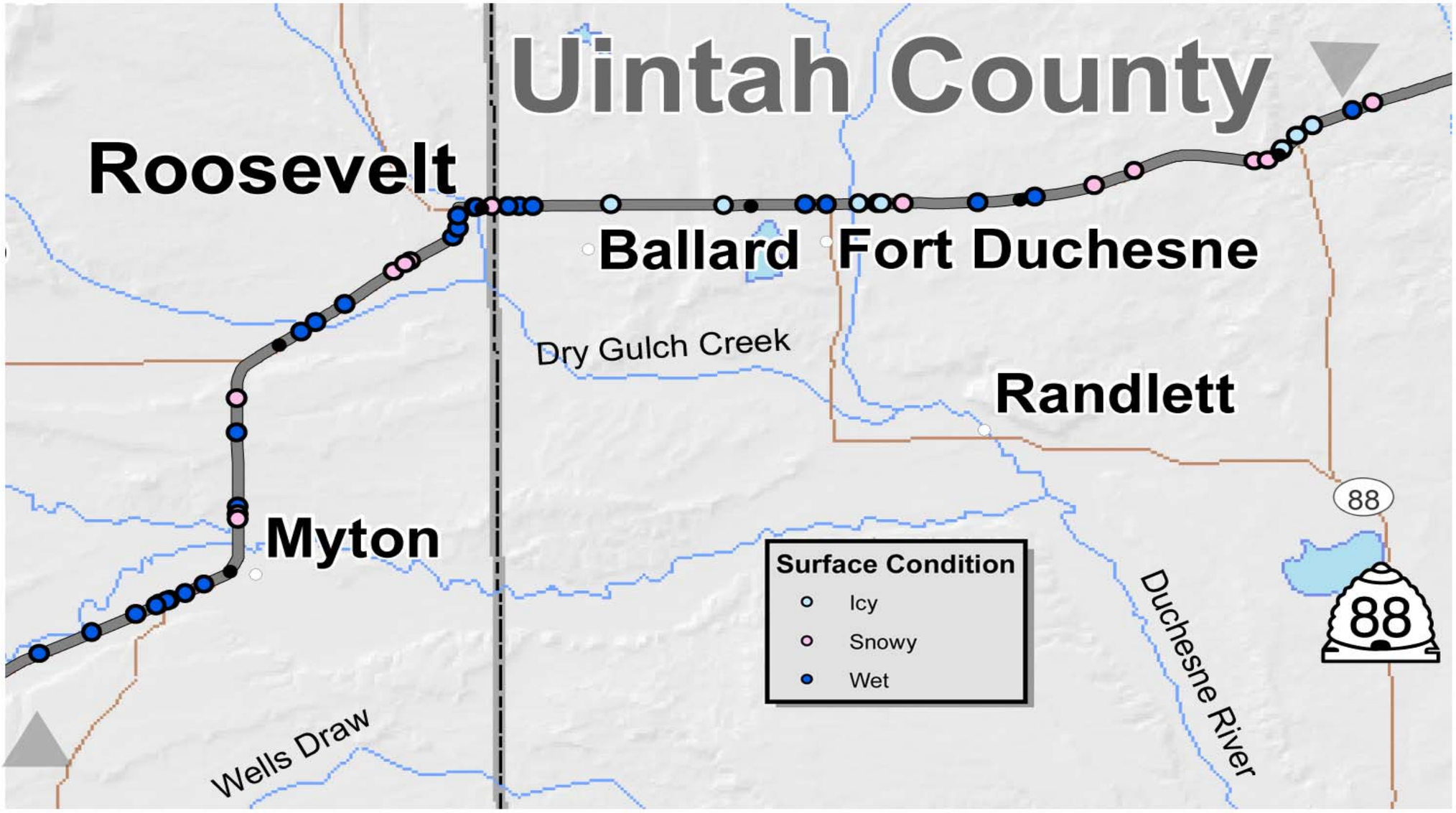

Figure 10. Accidents by Surface Conditions, 2001-2005, Map 3

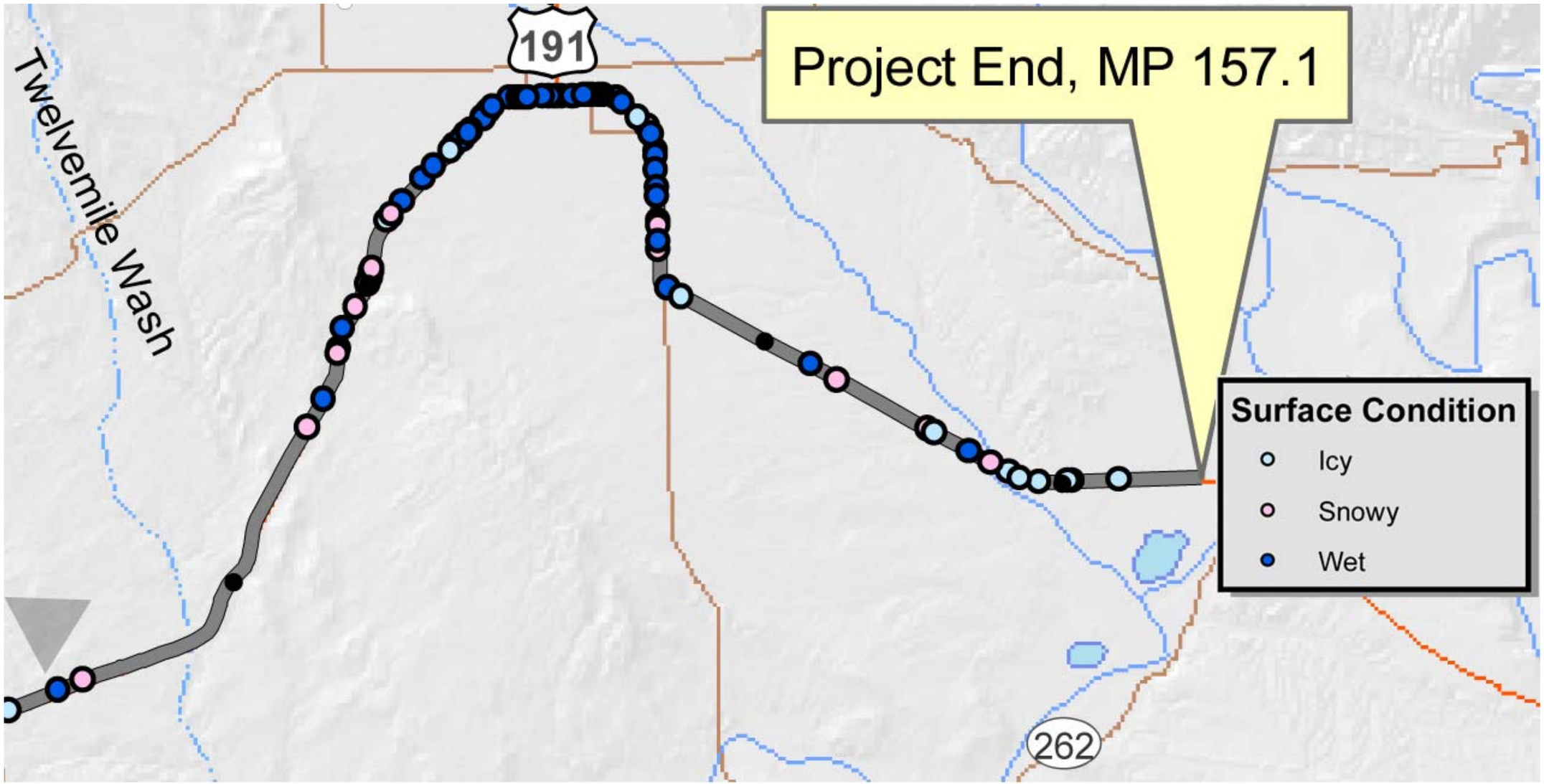

Figure 11. Accidents by Surface Conditions, 2001–2005, Map 4

Table 10 displays the crash data by crash severity and vehicle type. From this table it is evident that the severity of injury resulting from an accident is dependent in part upon the type of vehicle(s)involved. For example, motorcycles, although they made up only 1 percent of all crashes (31), accounted for 6 percent of fatal crashes (4). Pickup and SUVs made up almost half (47%, 1430) of the automobiles involved in crashes, but just over one third (35%) of those involved in fatal accidents.

Table 10. Crash History by Type of Vehicle, 2001-2005

Type of Vehicles Involved	Number of Vehicles Involved by Crash Severity									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Pickup/SUV	1430	47%	22	35%	249	41%	162	45%	997	50%
Passenger Car	1234	41%	28	44%	262	43%	161	45%	783	39%
Pickup/SUV & Other Trailer	47	2%	1	2%	9	1%	5	1%	32	2%
Tractor & Long Trailer	39	1%	2	3%	9	1%	3	1%	25	1%
Motorcycle	31	1%	4	6%	21	3%	4	1%	2	0%
Truck & Trailer	20	1%	1	2%	2	0%	2	1%	15	1%
Publicly Owned Passenger Car	19	1%	0	0%	3	0%	4	1%	12	1%
Pickup/SUV & House Trailer	18	1%	0	0%	2	0%	1	0%	15	1%
Enclosed Box Single Unit Truck	18	1%	1	2%	3	0%	2	1%	12	1%
Tractor & Short Trailer	18	1%	0	0%	4	1%	2	1%	12	1%
Hit & Run	17	1%	0	0%	9	1%	3	1%	5	0%
Tractor - Long trailer - Short Trailer	16	1%	1	2%	4	1%	2	1%	9	0%
Publicly Owned Pickup/SUV	10	0%	0	0%	1	0%	2	1%	7	0%
Pickup/SUV & Boat	9	0%	0	0%	3	0%	0	0%	6	0%
Truck & Trailer: Cab Only	9	0%	0	0%	3	0%	1	0%	5	0%
Pickup with Vehicle in Tow	9	0%	0	0%	8	1%	0	0%	1	0%
Motorhome	8	0%	0	0%	1	0%	1	0%	6	0%
Flatbed/Tow Truck	8	0%	0	0%	0	0%	0	0%	8	0%
Special Equipment (e.g. Fire Trucks)	7	0%	0	0%	3	0%	1	0%	3	0%
Tractor & 2 Trailers	7	0%	1	2%	0	0%	0	0%	6	0%
ATV/Snowmobile	5	0%	2	3%	1	0%	2	1%	0	0%
Dump Truck	5	0%	0	0%	2	0%	0	0%	3	0%
School Bus	4	0%	0	0%	2	0%	0	0%	2	0%
Pickup with Camper	3	0%	0	0%	0	0%	0	0%	3	0%
Ambulance	3	0%	0	0%	3	0%	0	0%	0	0%
Other: Carriage/ Plane/Etc.	3	0%	0	0%	0	0%	0	0%	3	0%
Truck & Long Trailer	3	0%	0	0%	1	0%	0	0%	2	0%
Motorhome with Boat or Vehicle in town	3	0%	0	0%	2	0%	0	0%	1	0%
Garbage Truck	3	0%	0	0%	0	0%	1	0%	2	0%
Passenger Car & Boat	2	0%	0	0%	0	0%	0	0%	2	0%
Truck & Mobile Home	2	0%	0	0%	0	0%	0	0%	2	0%
Tractor & 2 Short Trailers	2	0%	0	0%	0	0%	1	0%	1	0%
Commercial Bus	1	0%	0	0%	0	0%	0	0%	1	0%
Farm Equipment	1	0%	0	0%	1	0%	0	0%	0	0%
Tractor & 2 Long Trailers	1	0%	0	0%	0	0%	0	0%	1	0%
Cargo Tank	1	0%	0	0%	0	0%	0	0%	1	0%
Trailer with Vehicle in Tow	1	0%	0	0%	0	0%	0	0%	1	0%
Auto Transporter	1	0%	0	0%	1	0%	0	0%	0	0%
Snow Plow	1	0%	0	0%	0	0%	0	0%	1	0%
Total	**3019**		**63**	**2%**	**609**	**20%**	**360**	**12%**	**1987**	**66%**

Source: HDR, UDOT Office of Traffic and Safety

In other cases, the mix of vehicles on the road can contribute to the number and severity of crashes in an area. US 40 has seen increased truck activity over the course of the study period, due to an increase in oil activity in the area. The number of large commercial trucks involved in crashes jumped after 2001 from 4 percent to 5 percent, and has held steadily around 5 percent since (Table 11).

Table 11. Trucks as a Percentage of Vehicles in Crashes, 2001–2005

	2001	2002	2003	2004	2005
Number of trucks involved in crashes	22	31	26	33	31
Number of vehicles involved in crashes	555	591	549	643	664
Percent of vehicles which were trucks	4.0%	5.2%	4.7%	5.1%	4.7%

Source: HDR, UDOT Office of Traffic and Safety

Furthermore, as can be seen in Figures 12 through 15, crashes involving large trucks occurred particularly to the east of Duchesne from MP 87 to MP 89, and west of Roosevelt from MP 110 to MP 112; in neither case is there a passing lane for passenger cars to overtake slower truck traffic. Truck crashes were also prevalent in through Vernal's 35 mph in-town zone (MP 142 to MP 145).

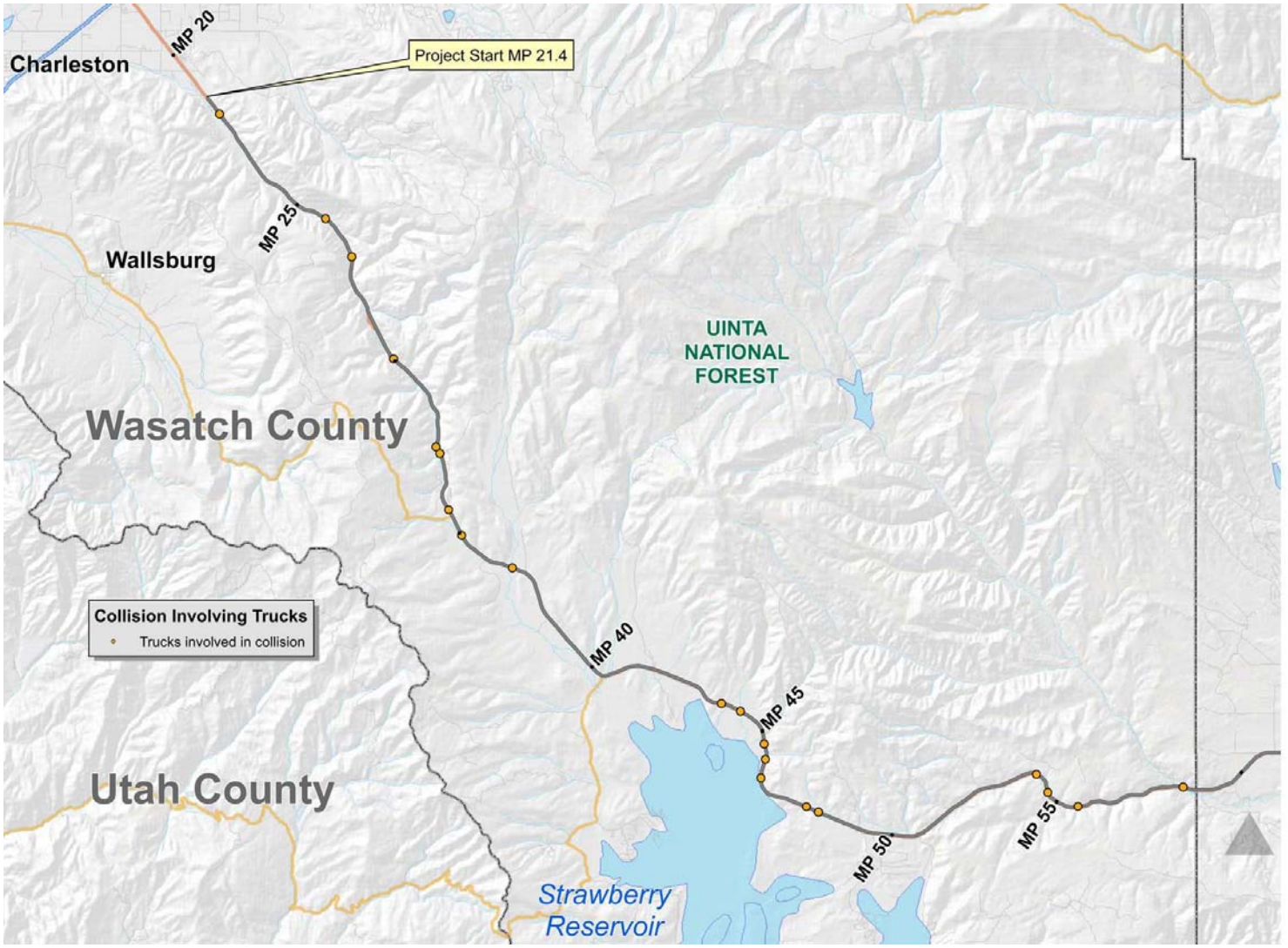

Figure 12. Collisions Involving Trucks, 2001-2005, Map 1

Figure 13. Collisions Involving Trucks, 2001–2005, Map 2

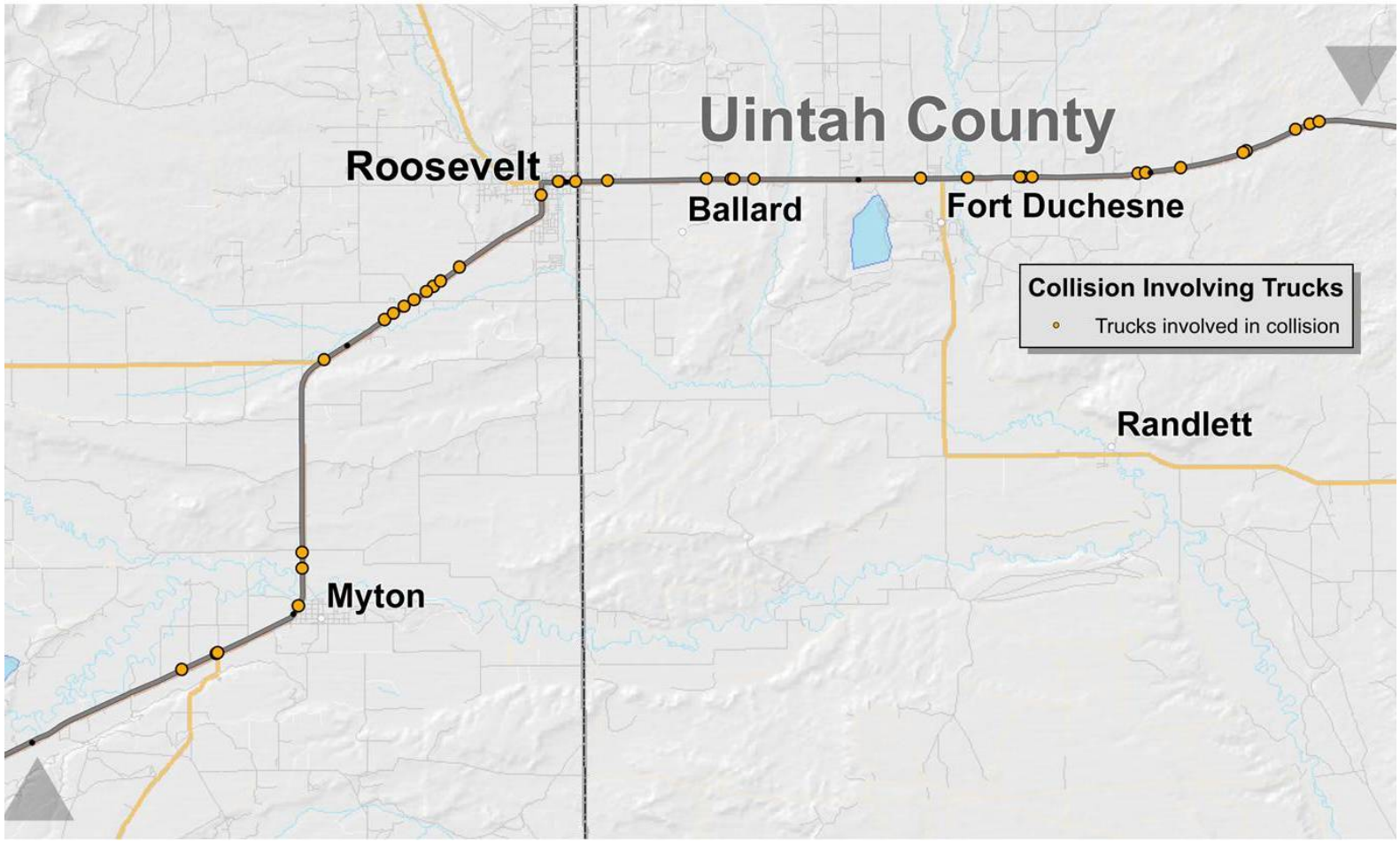

Figure 14. Collisions Involving Trucks, 2001-2005, Map 3

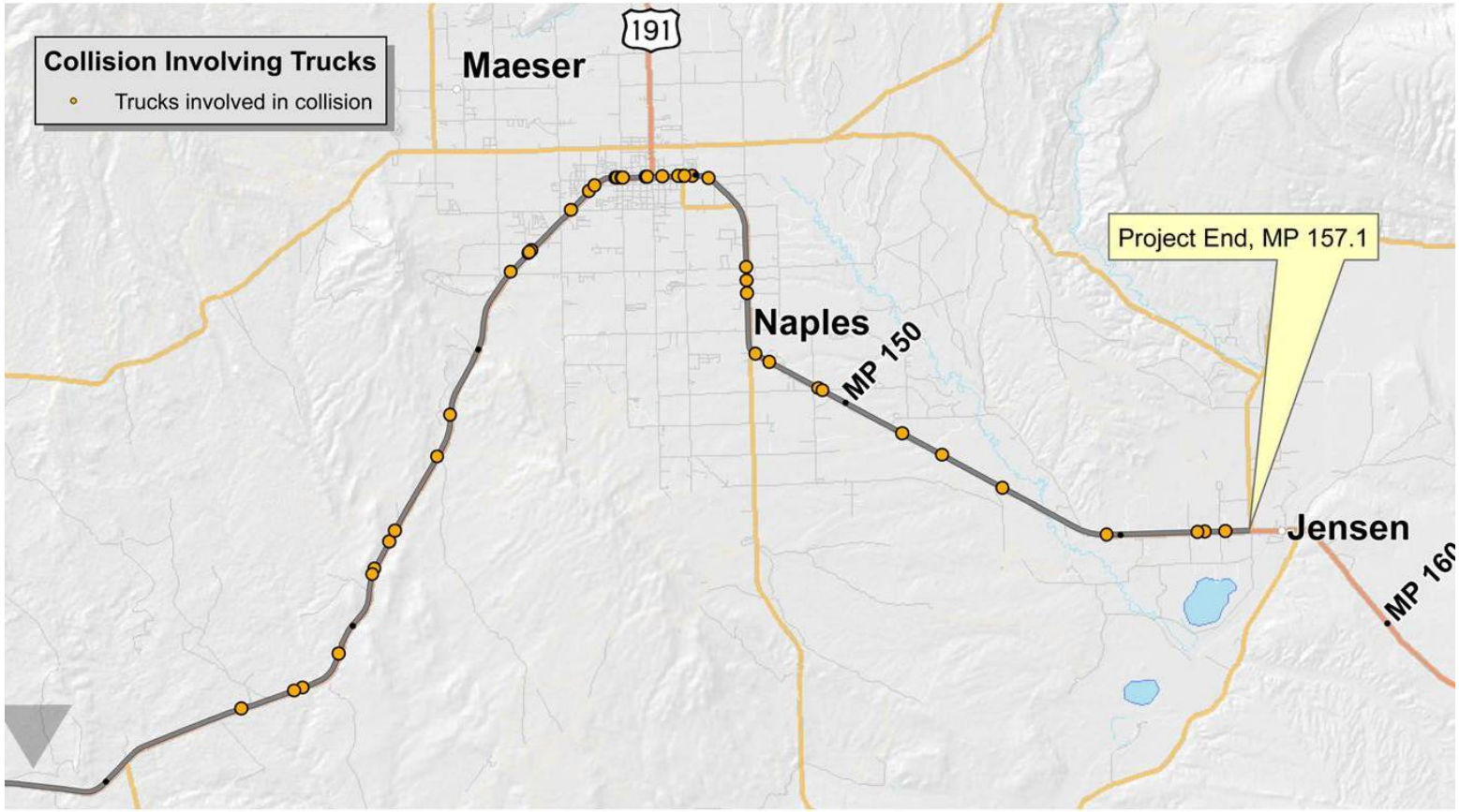

Figure 15. Collisions Involving Trucks, 2001-2005, Map 4

Table 12 summarizes the 5-year crash history by the type of collision that occurred. Most crashes involved a single vehicle: Table 13 shows the causes for those single vehicle crashes.

Of those crashes involving more than one vehicle, most were rear end collisions (191). Fatalities resulted primarily from head on collisions. Of those crashes resulting in evident injury, 11 percent (40) were caused by collision at a right angle. These data suggest that the nature of the collision, specifically, whether it is head-on, determines the likelihood and severity of injury. Special care should be taken to dissuade drivers from passing in risky places or manners. This may warrant more passing lanes in areas that get bottlenecked in heavy traffic.

Table 12. Crash History by Type of Collision, 2001–2005

Type of Collision	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Single Vehicle	1193	58%	6	18%	194	52%	89	42%	904	63%
Rear End	191	9%	1	3%	23	6%	36	17%	131	9%
Right Angle (Straight)	133	6%	3	9%	40	11%	22	10%	68	5%
Head On (Turn Left)	102	5%	5	15%	22	6%	10	5%	65	5%
Right Angle from Right (Turn Left)	90	4%	1	3%	25	7%	22	10%	42	3%
Parked Vehicle	48	2%	2	6%	4	1%	4	2%	38	3%
Rear End (Turn Left Same Direction)	42	2%	1	3%	10	3%	9	4%	22	2%
Side Swipe (Opp Direction)	39	2%	1	3%	13	3%	2	1%	23	2%
Side Swipe (Same Direction)	34	2%	-	-	3	1%	2	1%	29	2%
Head On	28	1%	12	36%	15	4%	-	-	1	0%
Rear End (Turn Right Same Direction)	26	1%	-	-	2	1%	6	3%	18	1%
Same Direction (1 Turn Right)	21	1%	-	-	1	0%	4	2%	16	1%
Right Angle from Right (Turn Right)	19	1%	-	-	6	2%	2	1%	11	1%
Same Direction (1 Turn Left)	18	1%	1	3%	6	2%	-	-	11	1%
Right Angle from Left (Turn Left)	18	1%	-	-	2	1%	-	-	16	1%
Same Direction (2 Turn Right)	14	1%	-	-	1	0%	1	0%	12	1%
U- Turn	11	1%	-	-	2	1%	3	1%	6	0%
Backing	7	0%	-	-	-	-	-	-	7	0%
Right Angle (2 Turn Left)	6	0%	-	-	-	-	1	0%	5	0%
Right Angle from Left (1 Turn Right)	4	0%	-	-	1	0%	-	-	3	0%
Opposite Direction (2 Turn Left)	3	0%	-	-	1	0%	-	-	2	0%
Angle (1 Turn Left, 1 Turn Right)	3	0%	-	-	2	1%	-	-	1	0%
Opposite Direction (1 Turn Left, 1 Turn Right)	2	0%	-	-	-	-	-	-	2	0%
Same Direction (2 Turn Left)	1	0%	-	-	1	0%	-	-	-	-
Same Direction Opposite Turns	1	0%	-	-	-	-	-	-	1	0%
Total	**2054**		**33**	**2%**	**374**		**213**	**10%**	**1434**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

Table 13. Single Vehicle Crash Data, 2001-2005

	Number	% of Single Vehicle Crashes
Wildlife Related	651	54.6
Ran Off Road Right	246	20.6
Ran Off Road Left	124	10.4
Fixed Object	50	4.2
Domestic Animal Related	45	3.8
Other Object Struck	33	2.8
Overturned in Roadway	18	1.5
Bicycle Related	10	0.8
Other Non-Collision	9	0.7
Pedestrian Related	7	0.6
Total	1,193	100.00%

Source: UDOT Office of Traffic and Safety

The following maps, Figures 16-19, show the locations of the accidents involving more than the car by collision type for the four most oft-reported types: head on, parked vehicle, rear end and right angle. As can be seen in Figures 18 and 19, these kinds of collisions are more likely to occur in urban areas.

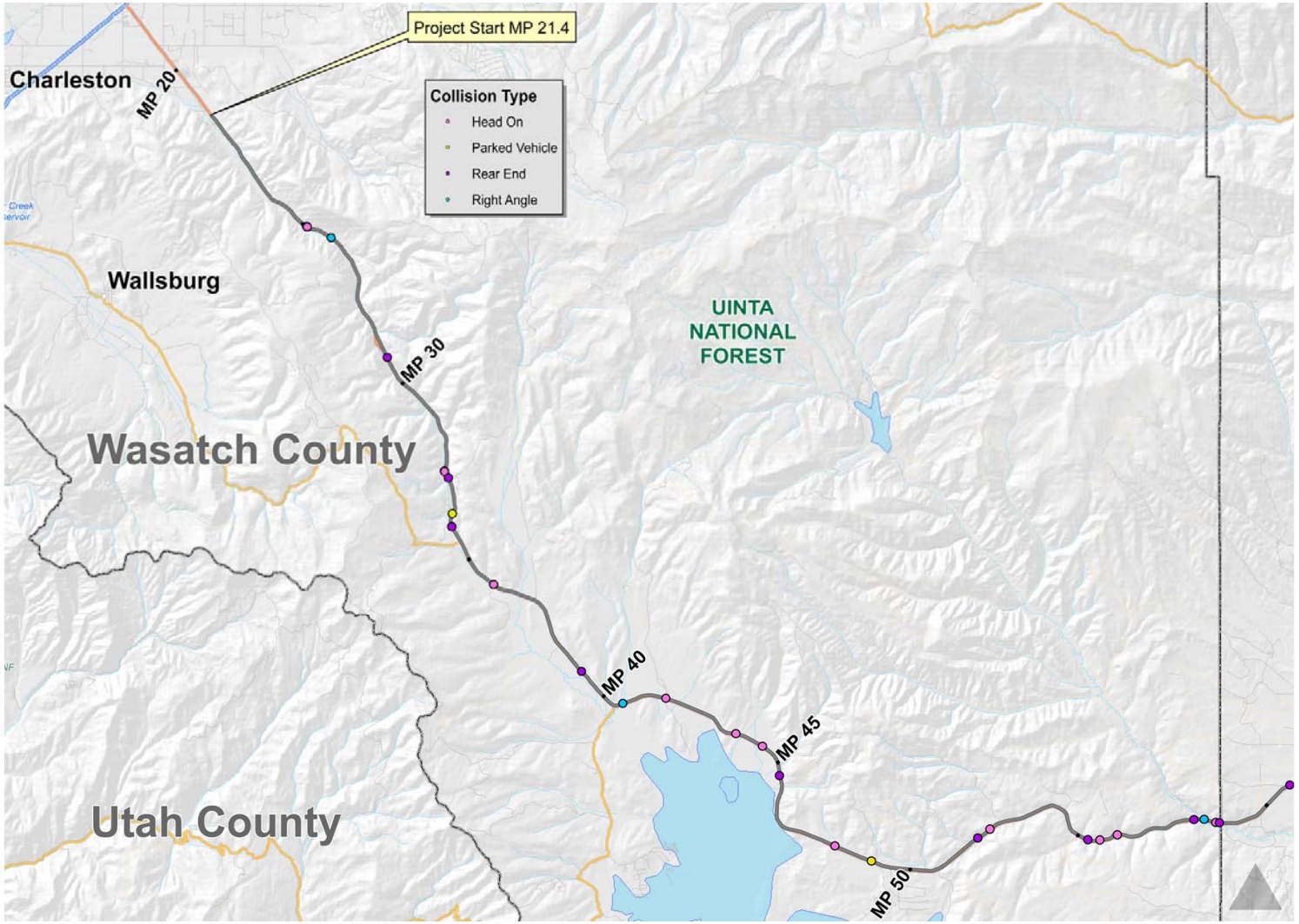

Figure 16. Crashes by Collision Type, 2001-2005, Map 1

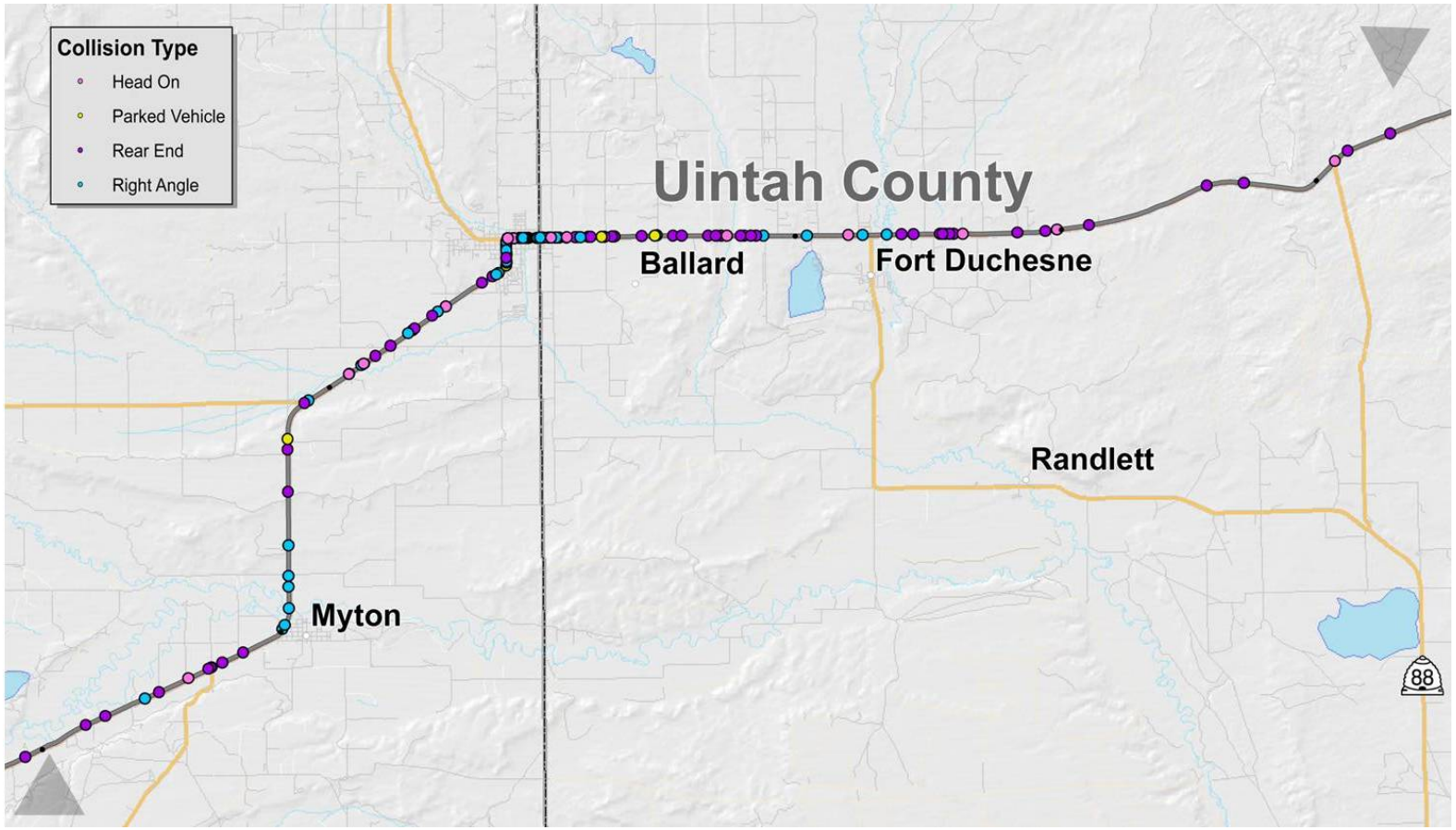

Figure 17. Crashes by Collision Type, 2001-2005, Map 2

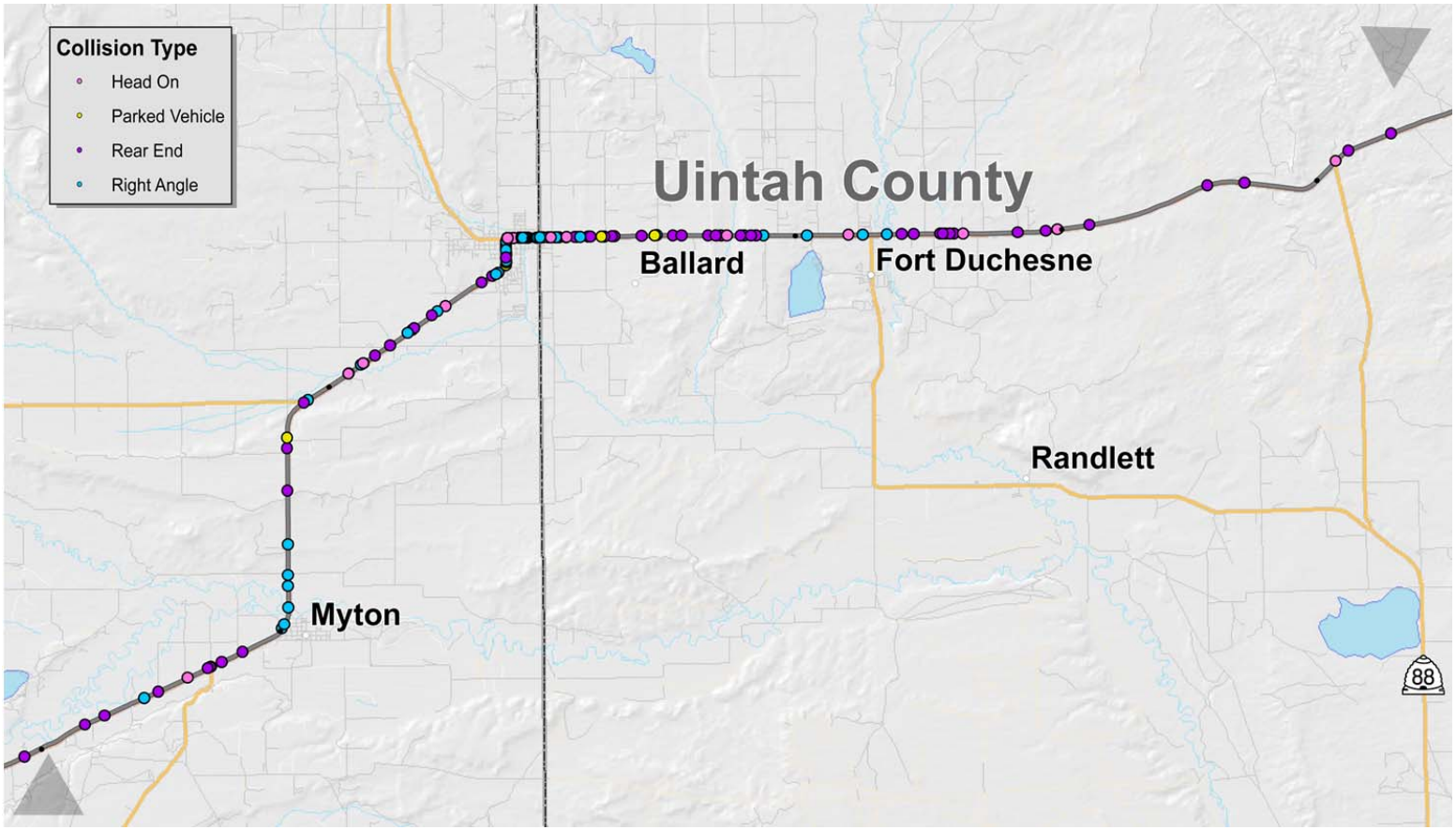

Figure 18. Crashes by Collision Type, 2001-2005, Map

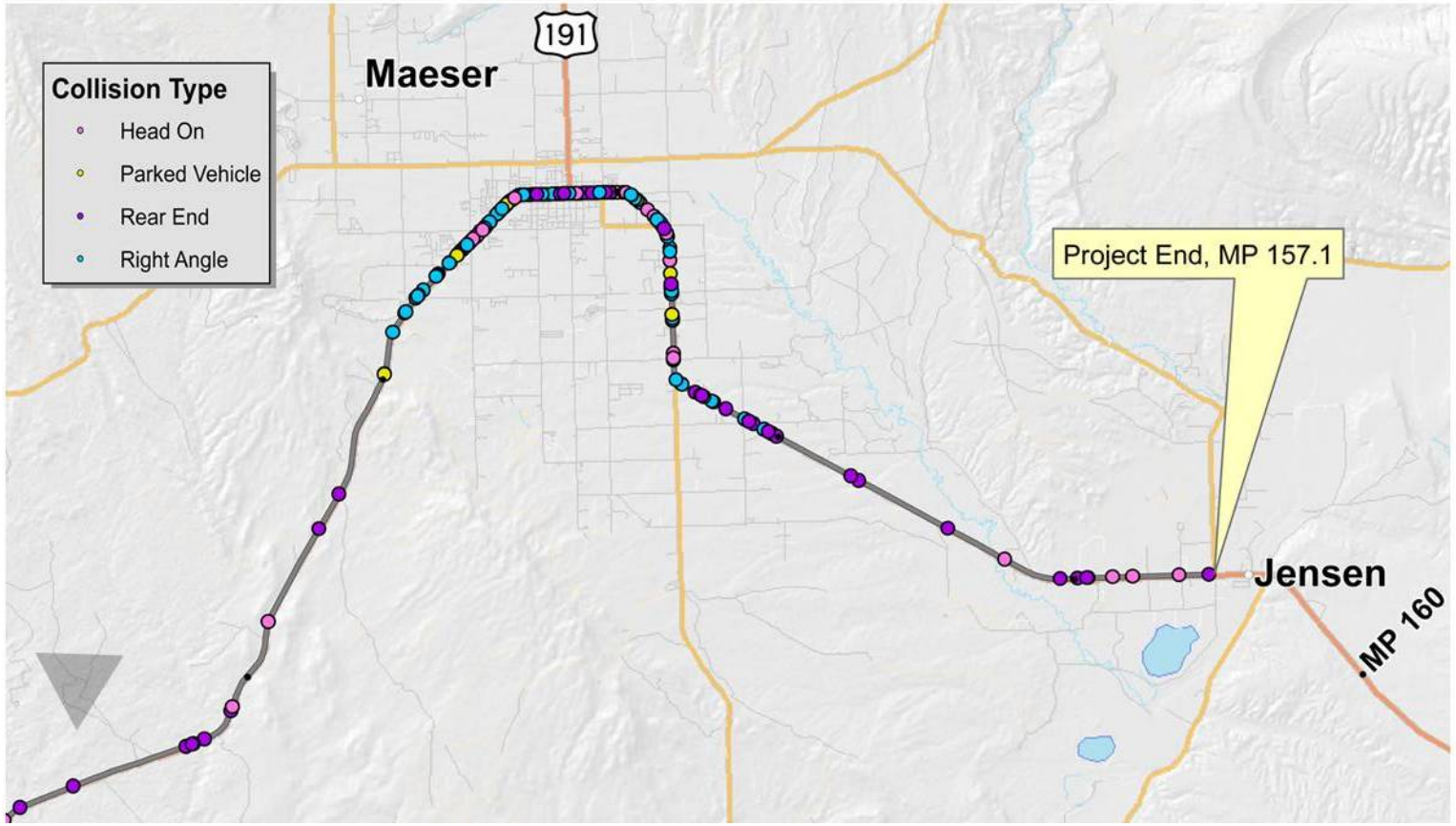

Figure 19. Crashes by Collision Type, 2001-2005, Map 4

Table 15 categorizes the crash data by the type and severity of accident. Of the total number of crashes, 40 percent involved a moving vehicle (827), and 32 percent (651) involved a wild animal. A wild animal was the cause of PDO crashes 42 percent of the time, more than the 36 percent caused by moving vehicles (511).

After vehicles and wild animals, 22 percent of possible injury (48) and 33 percent of evident injury accidents (125) resulted from running off the road to the right or left. Twice as many vehicles ran off the road to the right (247) than to the left (123). Running off the road to the right or left caused 18 percent of fatal crashes (6); 73 percent (24) involved another moving vehicle.

Table 14. Crash History by Type of Accident, 2001-2005

Type of Accident	Number of Crashes									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Moving Vehicle	827	40%	24	73%	171	46%	121	57%	511	36%
Wild Animal	651	32%	1	3%	27	7%	25	12%	598	42%
Ran off Road - Right	247	12%	4	12%	83	22%	35	16%	125	9%
Ran off Road - Left	123	6%	2	6%	42	11%	13	6%	66	5%
Fixed Object	50	2%	-	-	4	1%	6	3%	40	3%
Domestic Animal	47	2%	1	3%	8	2%	4	2%	34	2%
Other Non Collision	41	2%	1	3%	10	3%	3	1%	27	2%
Other Object	33	2%	-	-	6	2%	2	1%	25	2%
Overturned	18	1%	-	-	9	2%	3	1%	6	0%
Bicycle	10	0%	-	-	8	2%	1	0%	1	0%
Pedestrian	7	0%	-	-	6	2%	-	-	1	0%
Total	**2054**		**33**	**2%**	**374**	**18%**	**213**	**10%**	**1434**	**70%**

Source: HDR, UDOT Office of Traffic and Safety

Figures 20-23 map the location of accidents by accident type.

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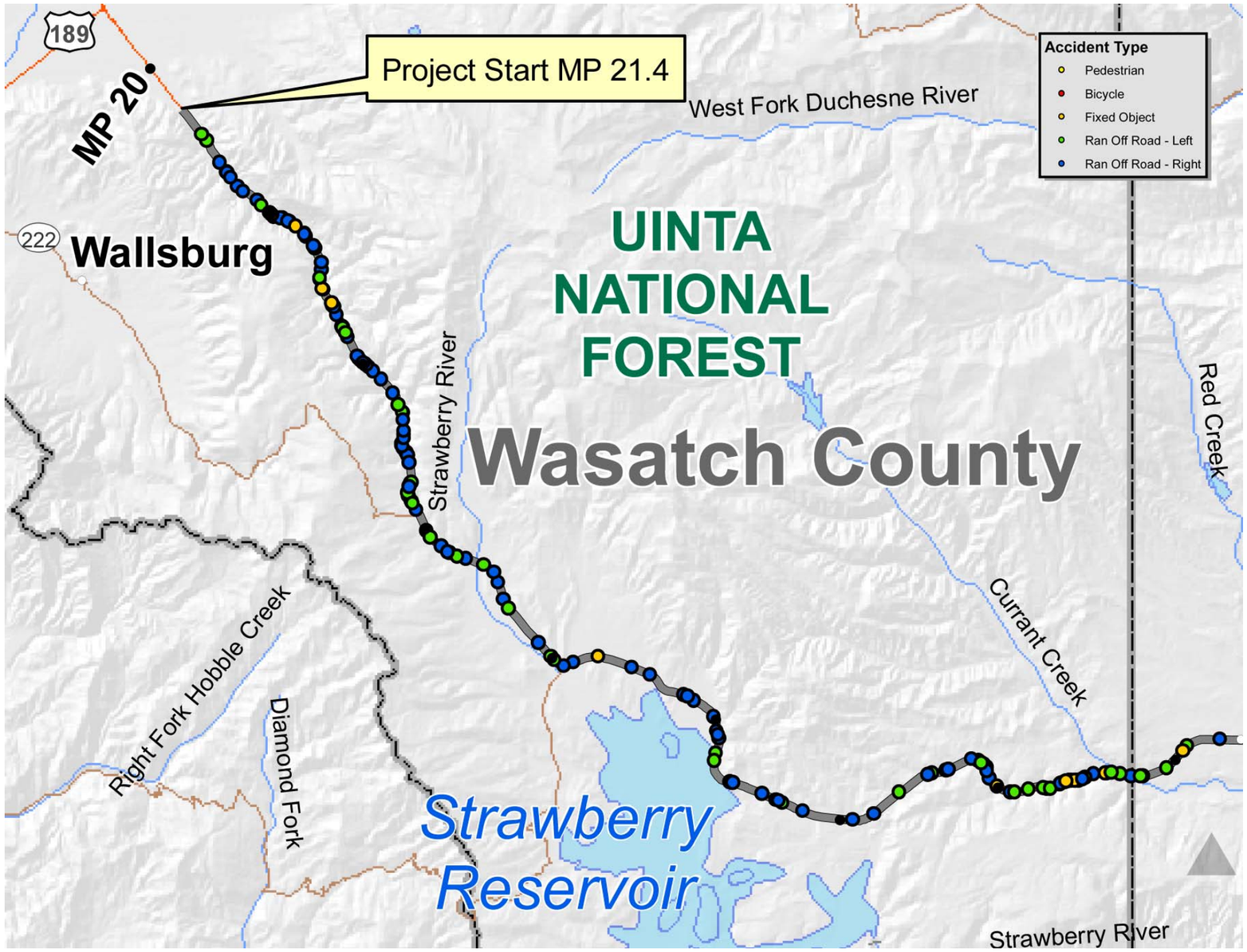

Figure 20. Accident Type, 2001-2005, Map 1.

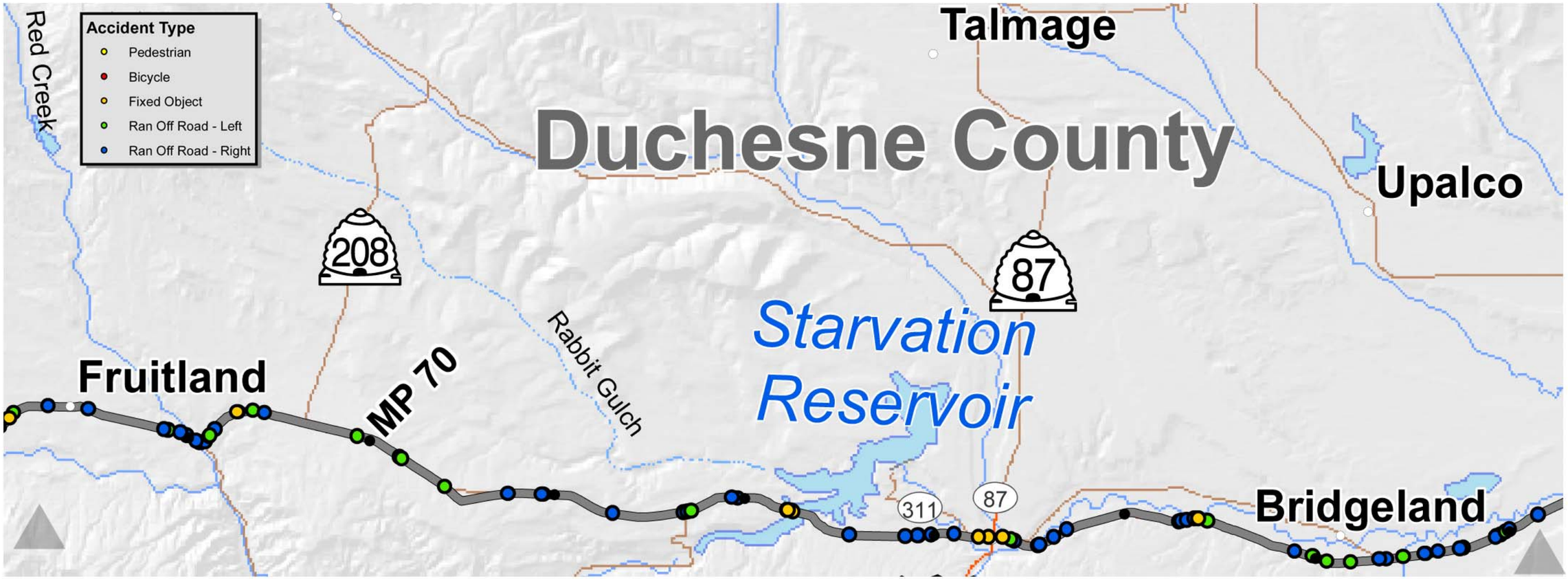

Figure 21. Accident Type, 2001-2005, Map 2.

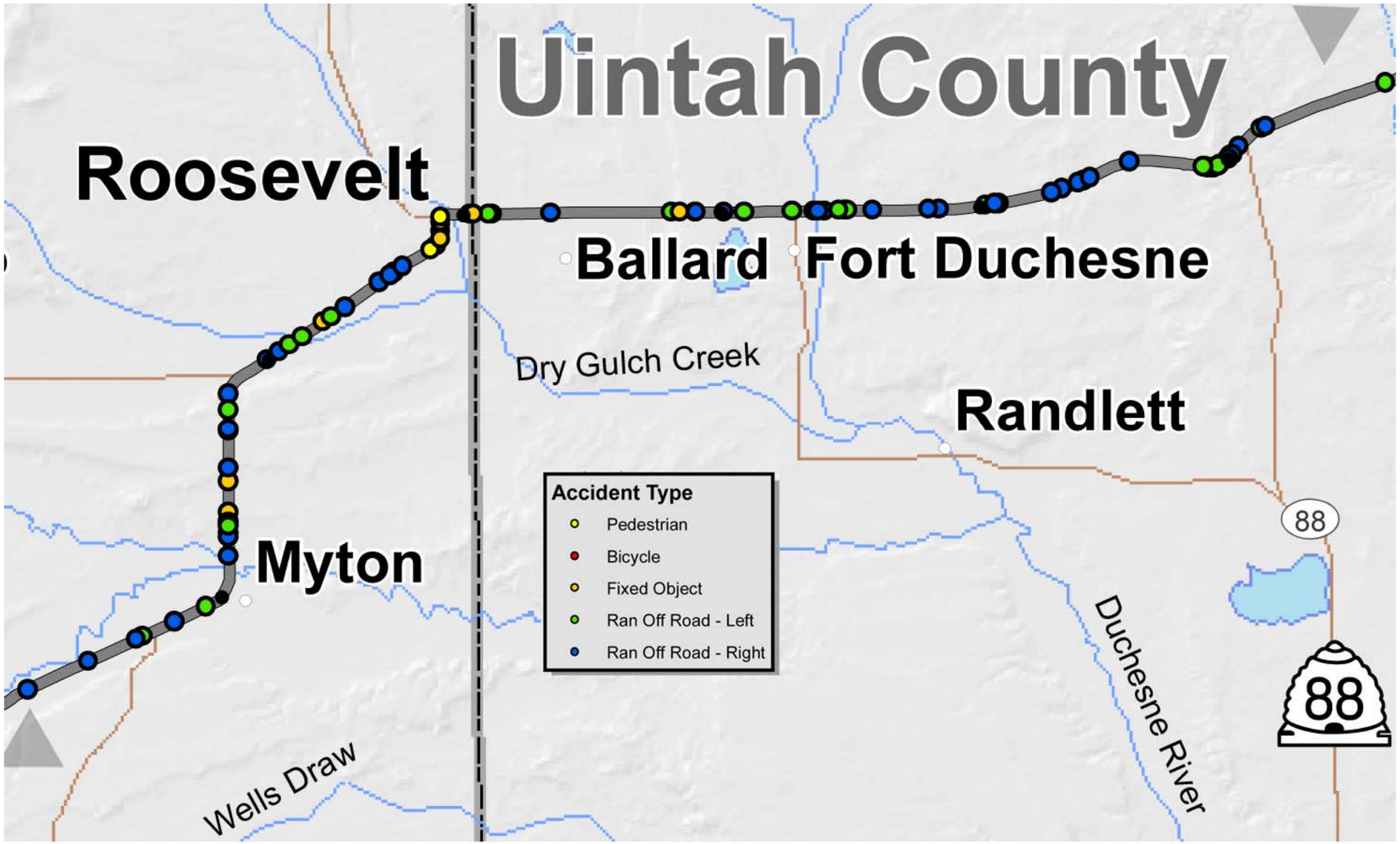

Figure 22. Accident Type, 2001–2005, Map 3.

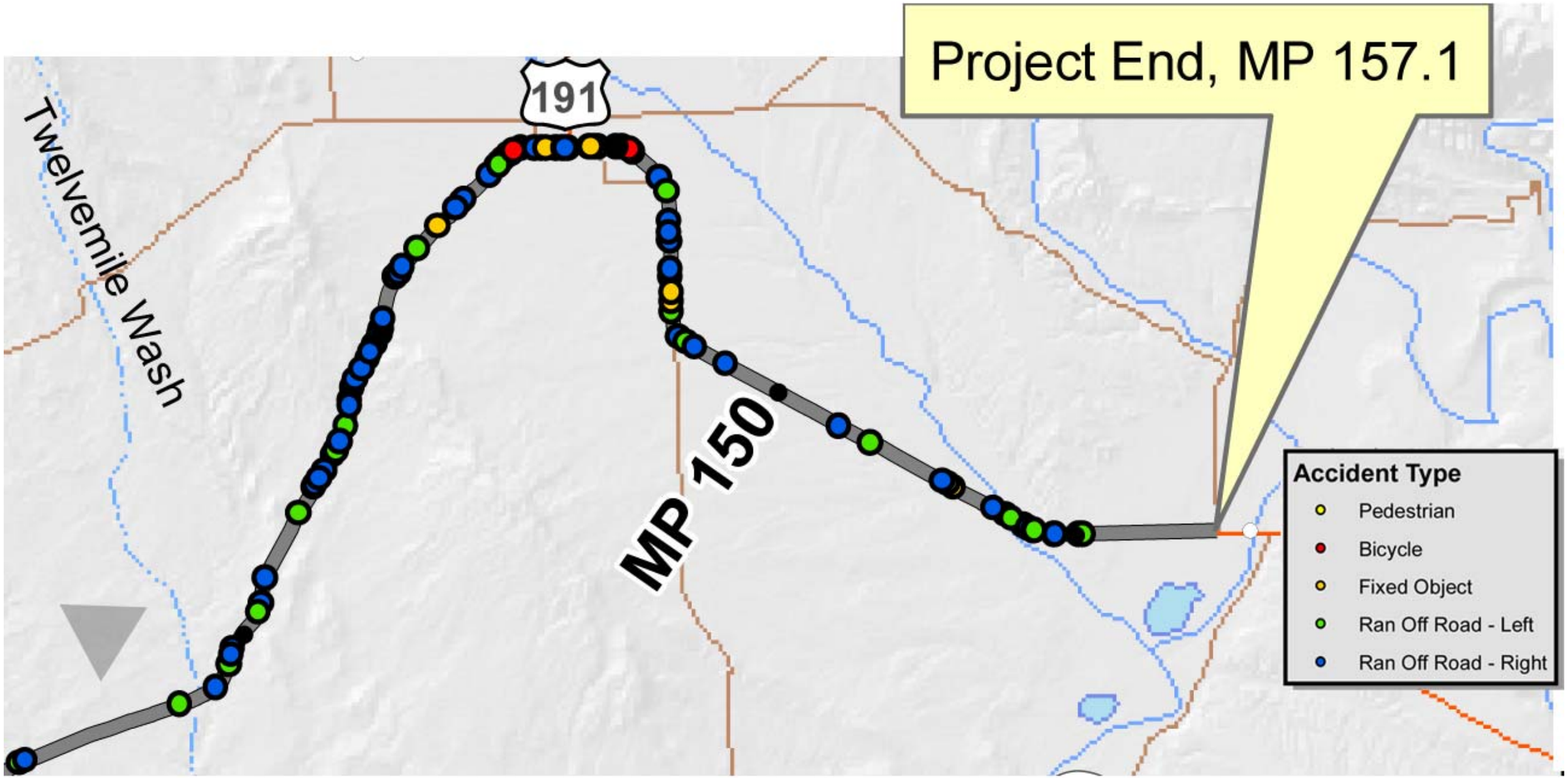

Figure 23. Accident Type, 2001–2005, Map 4.

Generally, many crashes involving wild animals would not be reported; particularly those where no or little damage to the vehicle occurred. Therefore it might be proper to assume that crashes involving wild animals might be more common that what reports indicate.

The following maps indicate the occurrence of accidents involving animals (Figures 24-27). Collisions with wild animals are common along the study area, dropping off only from MP 125 to MP 145. Along that 20-mile stretch, 13 crashes involving wild animals were reported from 2001 to 2005, accounting for 2 percent of all such crashes, and just under 15 percent of the length of the study area. The rest of the wild-animal associated crashes are fairly evenly dispersed along the remainder of the corridor, at both higher and lower elevations.

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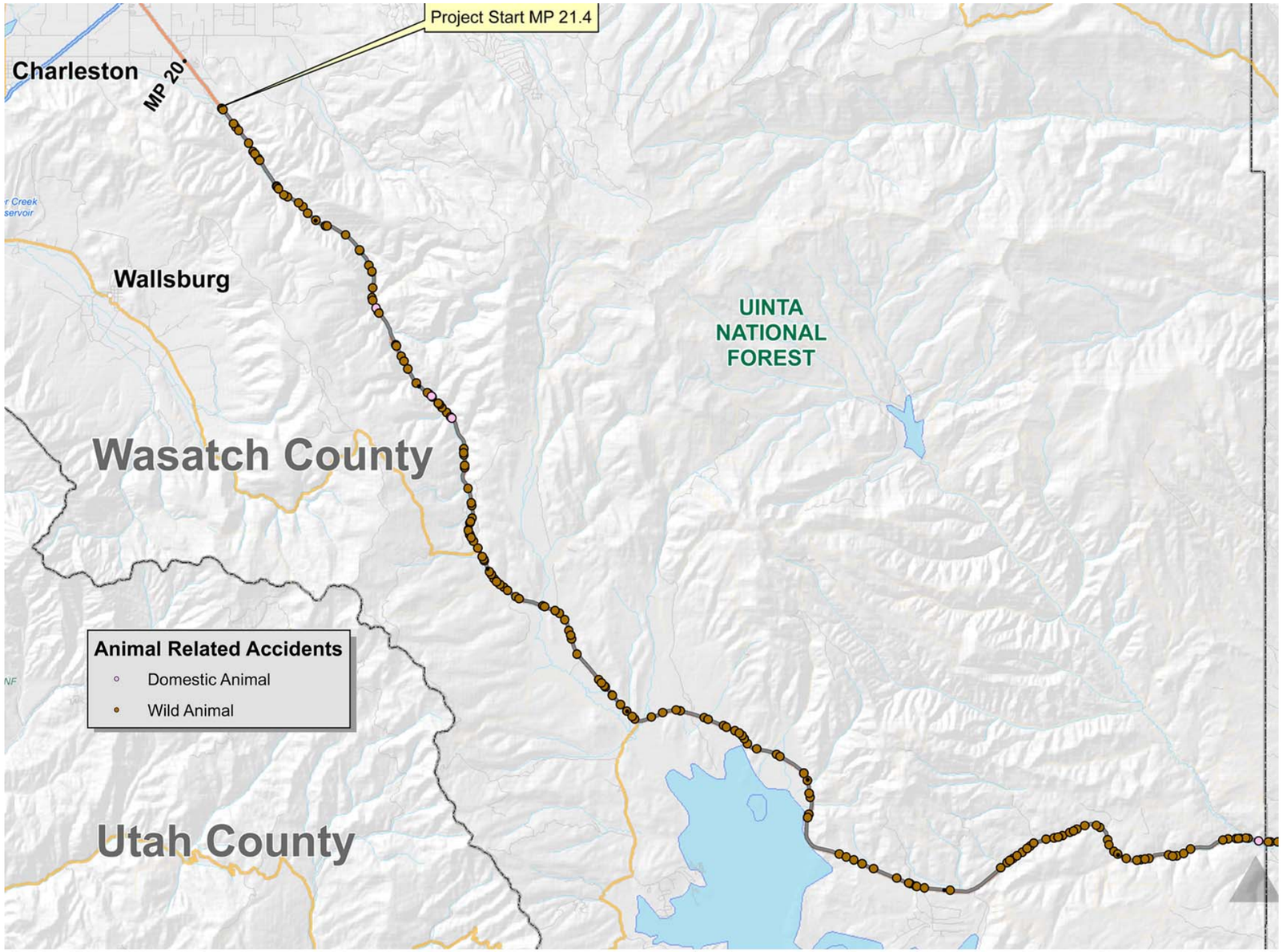

Figure 24. Animal Related Accidents, 2001-2005, Map 1.

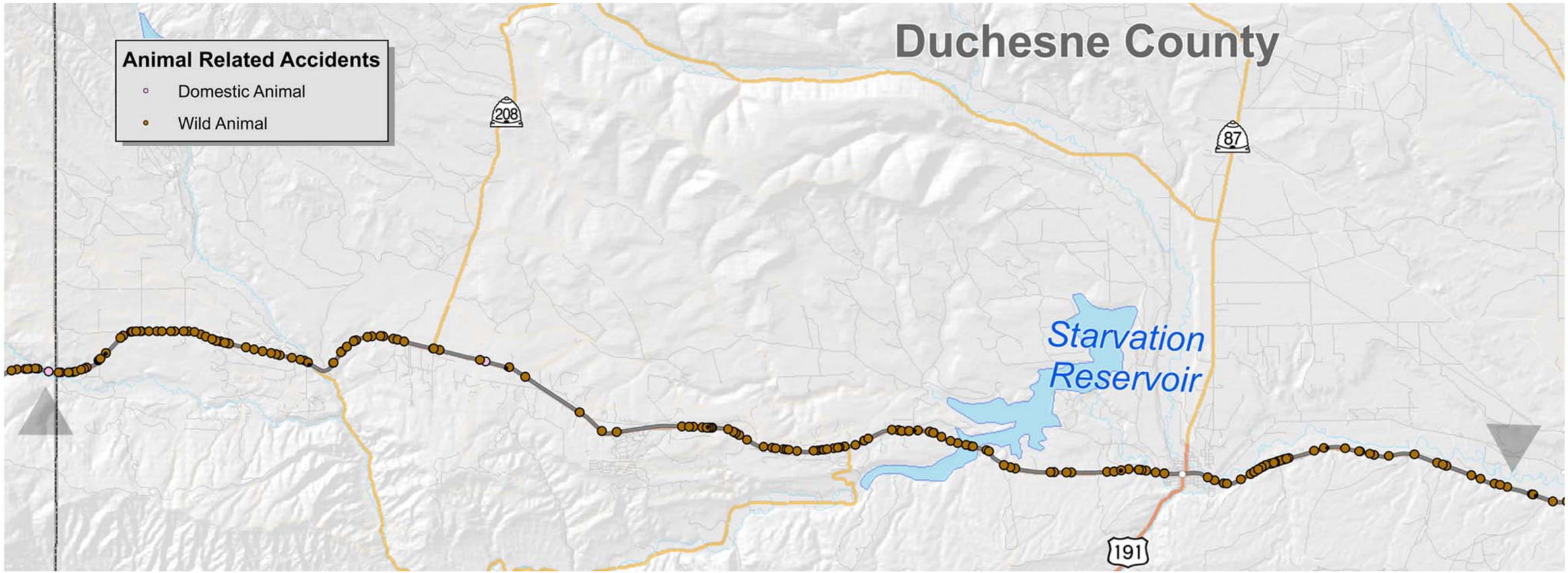

Figure 25. Animal Related Accidents, 2001-2005, Map 2.

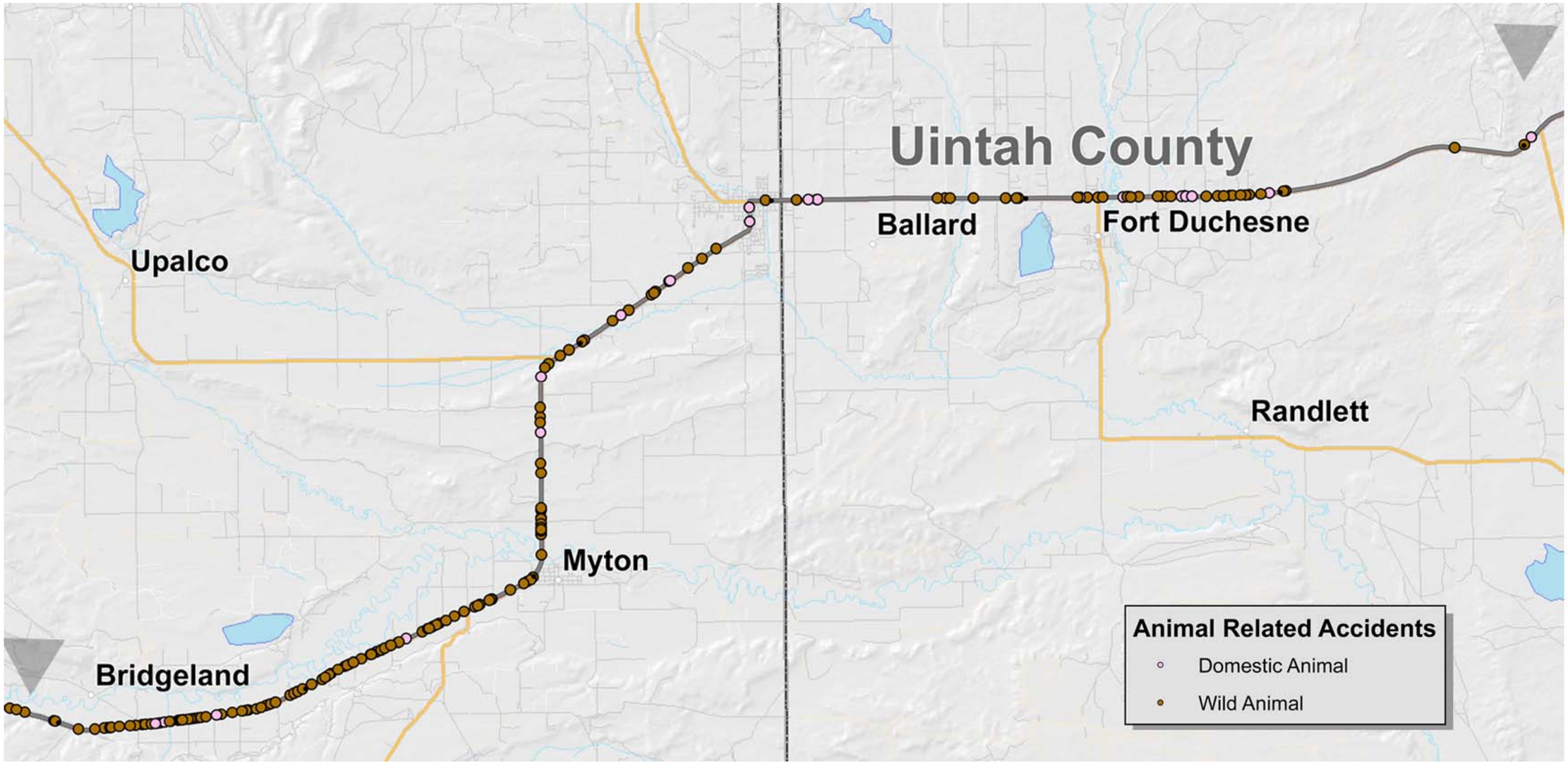

Figure 26. Animal Related Accidents, 2001-2005, Map 3

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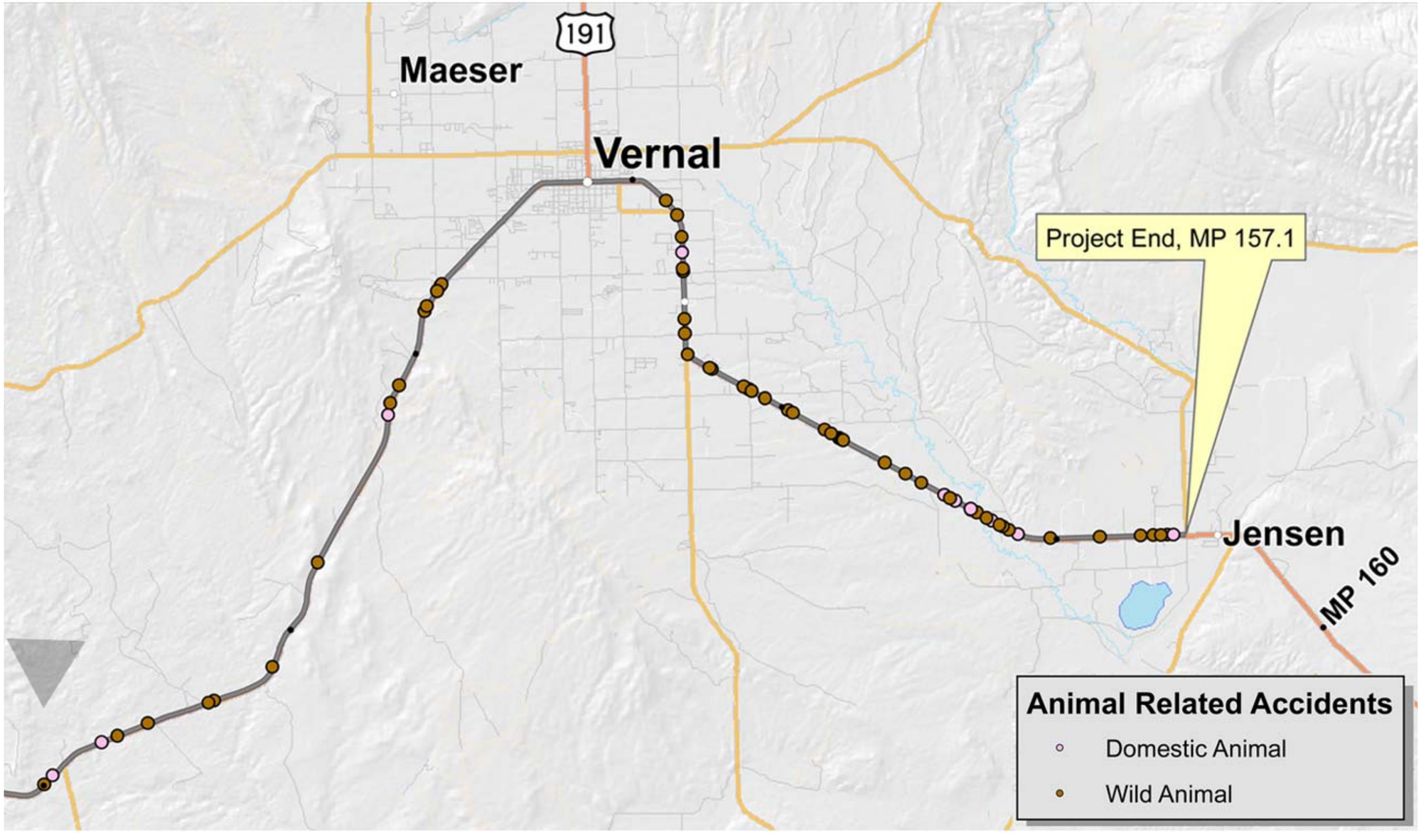
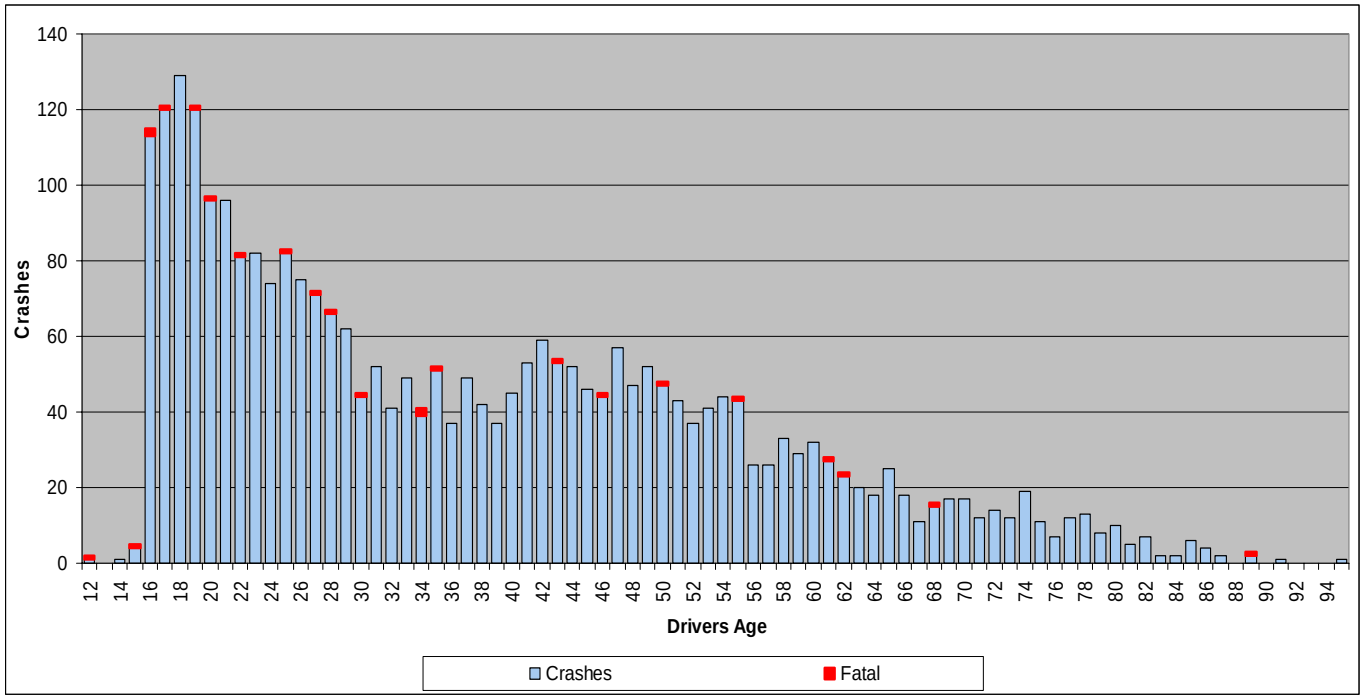


Figure 27. Animal Related Accidents, 2001-2005, Map 4.

5.1 Drivers & Circumstances

Figure 29 illustrates the crash data by driver age. For the study area overall, younger drivers had more crashes than older ones. Drivers aged 16 to 19 had 16 percent of the crashes on the corridor while those aged 20 to 29 had 26 percent of crashes. Fatalities followed this broader trend, with 26 percent of fatal crashes involving drivers under the age of 19, and 22 percent involving drivers in their 20s.

Figure 28. Crash History by Driver's Age, 2001-2005



Source: HDR, UDOT Office of Traffic and Safety

In many cases, one or more of the vehicles involved in a crash were not considered to be a contributing factor in the crash. This was true for 48 percent of all vehicles in crashes; 53 percent of vehicles in PDO crashes, 43 percent of those in fatal crashes, 40 percent of those in possible injury crashes, and 36 percent of those in evident injury crashes.

Table 16 lists the contributing circumstances for those vehicles that were judged to have contributed to the crash. Failure to yield right-of-way was

cited most often among contributing circumstances, accounting for 16 percent of all vehicles contributing to an accident (258) and 19 percent (71) of those contributing to evident injury crashes. Improper lookout and moving at too fast a speed each accounted for 15 percent of vehicles contributing to crashes (231 and 229).

Driving Under the Influence (DUI) was a contributing factor in 50 crashes, or 3 percent of those for which causes were cited. Approximately fourteen of these DUI-related crashes (28 percent) occurred between MP 108 and MP 116, as US 40 crosses the Uintah and Ouray Reservation, and are concentrated in the town of Roosevelt. This may be due to a liquor store on US 40 at Lagoon Road.

Table 15. Crash History by Contributing Circumstances, 2001-2005

Contributing Circumstance	Contributing Circumstances by Crash Severity									
	Total		Fatal		Evident Injury		Possible Injury		PDO	
Speed too Fast	229	8%	6	217%	57	9%	29	8%	137	7%
Failed to yield Right of Way	258	9%	4	244%	71	12%	29	8%	154	8%
Drove Left of Center	26	1%	3	14%	13	2%	1	0%	9	0%
Improper Overtaking	24	1%	2	21%	7	1%	2	1%	13	1%
Passed Stop Sign	8	0%	0	5%	2	0%	3	1%	3	0%
Disregard Traffic Signal	41	1%	0	43%	5	1%	9	3%	27	1%
Followed to Closely	145	5%	3	149%	17	3%	31	9%	94	5%
Made Improper Turn	74	2%	2	75%	16	3%	9	3%	47	2%
Had been Drinking	6	0%	0	5%	2	0%	1	0%	3	0%
Under the influence of Drugs	2	0%	0	0%	1	0%	1	0%	0	0%
Eyesight Defective	1	0%	0	2%	0	0%	0	0%	1	0%
Asleep	68	2%	0	44%	31	5%	9	3%	28	1%
Fatigued	19	1%	2	14%	6	1%	2	1%	9	0%
ILL	4	0%	0	0%	3	0%	1	0%	0	0%
Improper Parking	2	0%	0	3%	0	0%	0	0%	2	0%
Improper Lookout	231	8%	2	241%	43	7%	34	9%	152	8%
Failed to Signal	5	0%	0	6%	1	0%	0	0%	4	0%
Other Improper Driving	67	2%	3	56%	21	3%	8	2%	35	2%
Brakes Defective	9	0%	0	10%	1	0%	2	1%	6	0%
Headlight Insufficient or out	2	0%	0	2%	0	0%	1	0%	1	0%
Headlights Glaring	2	0%	0	2%	1	0%	0	0%	1	0%
Other Lights Defective	7	0%	2	6%	1	0%	0	0%	4	0%
Steering Mechanism Defective	2	0%	0	0%	1	0%	1	0%	0	0%
Tires Defective	11	0%	0	11%	3	0%	1	0%	7	0%
Windshield not Clear	2	0%	0	2%	0	0%	1	0%	1	0%
Other Defective Condition	16	1%	1	0%	2	0%	2	1%	11	1%
Hit & Run	10	0%	0	13%	2	0%	0	0%	8	0%
DUI	50	2%	2	19%	30	5%	6	2%	12	1%
Non-Collision Fire	7	0%	0	11%	0	0%	0	0%	7	0%
Non-Contact Vehicle Involved	9	0%	0	10%	2	0%	1	0%	6	0%
Jackknife	1	0%	0	0%	0	0%	1	0%	0	0%
Cargo Loss or Shifted	24	1%	0	30%	3	0%	2	1%	19	1%
Explosion of Fire	1	0%	0	2%	0	0%	0	0%	1	0%
Separation of Units	5	0%	0	6%	1	0%	0	0%	4	0%
Wrong Side of Road	8	0%	1	3%	5	1%	0	0%	2	0%
Improper Backing	8	0%	0	13%	0	0%	0	0%	8	0%
Towed Vehicle	8	0%	0	10%	1	0%	1	0%	6	0%
Rolling Vehicle in Traffic Lane	2	0%	0	3%	0	0%	0	0%	2	0%
Driver Using Cell Phone	1	0%	0	2%	0	0%	0	0%	1	0%
Other Driver Distraction	18	1%	0	6%	11	2%	3	1%	4	0%
Object in Roadway	26	1%	1	29%	5	1%	2	1%	18	1%
Aggressive Driving	6	0%	1	2%	2	0%	2	1%	1	0%
99	60	2%	0	56%	14	2%	11	3%	35	2%
U	2	0%	0	2%	1	0%	0	0%	1	0%
(blank)	72	2%	1	84%	10	2%	8	2%	53	3%
total	**1579**		**36**	**2%**	**392**	**25%**	**214**	**14%**	**937**	**59%**

Source: HDR; UDOT Office of Traffic and Safety

6.0 General Recommendations

UDOT should explore ways to effectively deter animal collisions; this may include animal detection systems linked to variable message signs, fencing, reduced speed limits during certain hours of operation or during certain seasons.

With the increasing truck activity on the corridor crash rates and severity should be monitored to ensure safe operating conditions into the future.

UDOT should explore policy development to effectively reduce the high involvement in crashes of young drivers. Young drivers tend to perceive less risk associated with traffic hazards and to overestimate their ability to control a vehicle under emergency conditions. To them driving is about rights but not about obligations. A pilot program could be initiated by UDOT within Region 3 to create a task force with local young victims and/or crash victim's parents. This group could conduct meetings and workshops at high schools to provide a direct and vivid experience of the obligations and risks involved in driving.